

Grade 9 EQAO Assessment of Mathematics

Academic

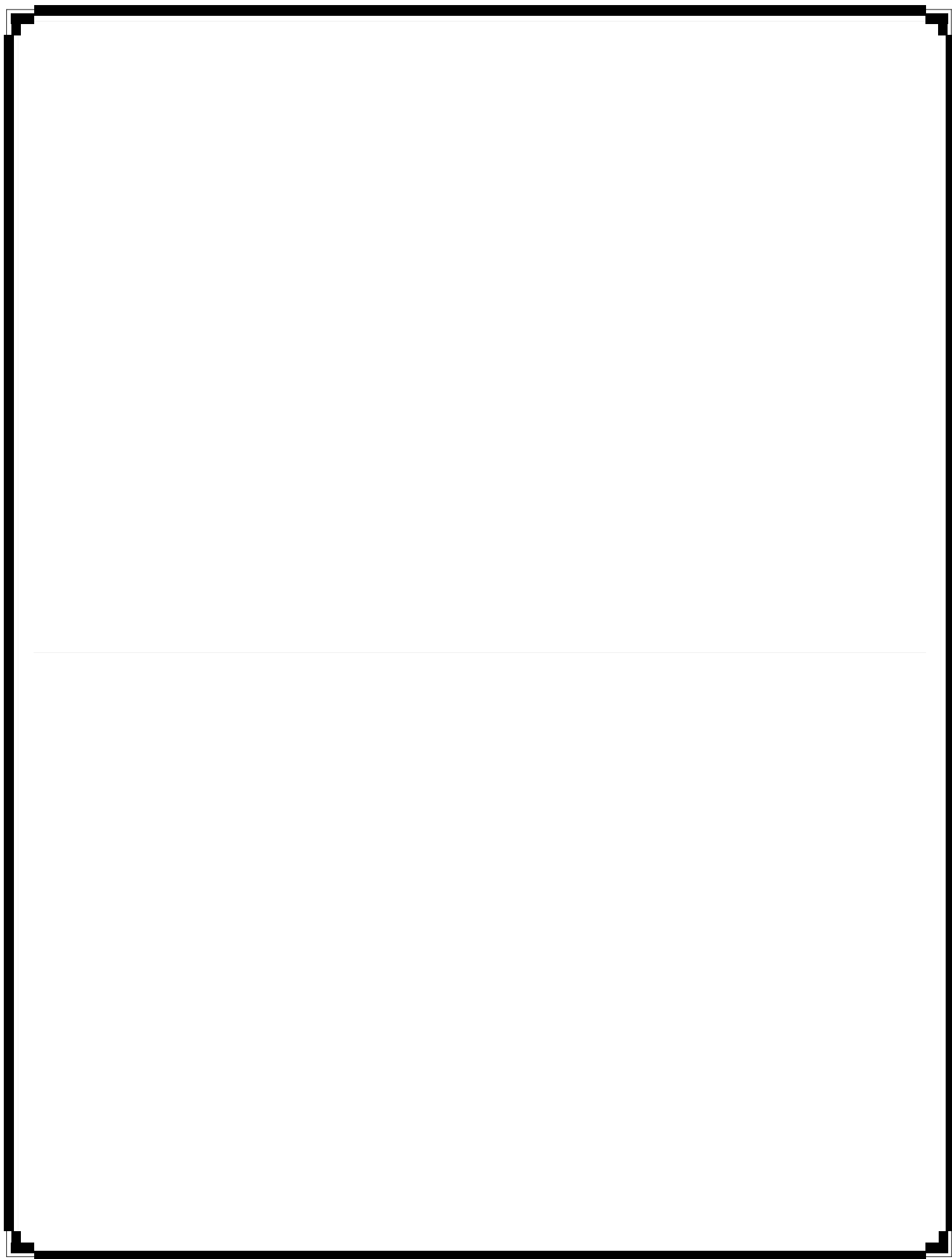
Student Preparation Booklet

Name: _____

Teacher: _____

School: _____

Contents: Key Words
Strategies for Multiple Choice and Open Response Questions
EQAO Formula Sheet
Sample Questions from the Winter 2009 Assessment
Sample Questions from the Spring 2009 Assessment
Sample Questions from the Winter 2008 Assessment
Sample Questions from the Spring 2008 Assessment
Sample Questions from the Winter 2007 Assessment
Sample Questions from the Spring 2007 Assessment



Grade 9 EQAO Assessment of Mathematics

Key Words

Throughout the assessment, key words are used to identify the type of response required from you. The key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

Compare:

Tell what is the same and what is different.

Describe:

Use words to create a mental picture for the reader.

Determine:

Use mathematics to find a solution to the problem.

List:

Use point form.

Explain:

Use words and symbols to make your solution clear.

Justify:

Give reasons and evidence to show your answer is correct.

Show your work:

Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.

Tools you should have access to:

- Pencil, ruler and eraser
- Scientific or Graphing calculator (You may not share with another student)
- Manipulatives (example: integer or algebra tiles)

Strategies for Multiple Choice Questions:

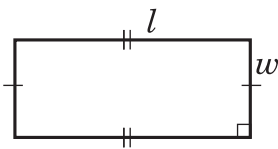
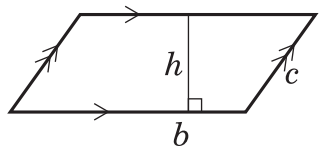
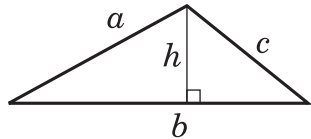
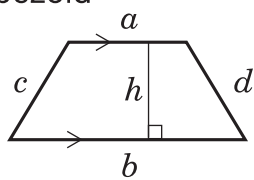
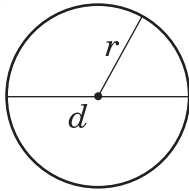
1. Cover the question choices and read the question stem carefully and highlight key words.
2. Look at the choices and eliminate any of the responses that are not possible.
3. There is only **one** answer per question. Choose the best possible answer and shade your choice on the answer sheet.
4. Answer every question, there are no penalties for guessing.
5. Question that have a graph are drawn to scale. Questions that have a diagram are usually not drawn to scale.

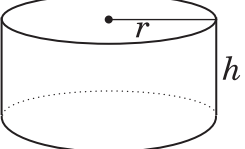
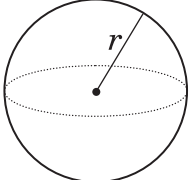
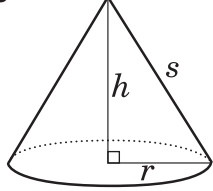
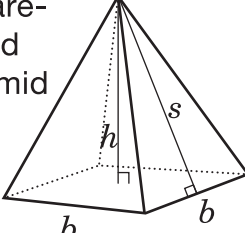
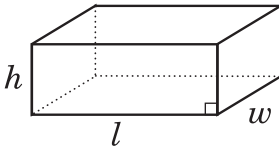
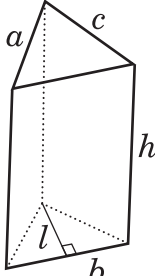
Strategies for Open Response Questions:

1. These questions are designed to get you to think deeply about the mathematics you know. Complete solutions including any rough work are expected for these questions.
2. Read the question carefully and highlight any key words or information.
3. Write your solution in the space provided.
4. Don't erase any of your calculations, drawing or reasoning.
5. Use the list of key words on the previous page to help you decide what is expected in your answer. For example, **explain** means to use words and symbols to make your solution clear and understandable.
6. The problems in these questions often have more than one way of being solved. Be sure to clearly explain your solution using pictures numbers and words.

Formula Sheet

Grade 9 Academic

Geometric Figure	Perimeter	Area
<p>Rectangle</p> 	$P = l + l + w + w$ or $P = 2(l + w)$	$A = lw$
<p>Parallelogram</p> 	$P = b + b + c + c$ or $P = 2(b + c)$	$A = bh$
<p>Triangle</p> 	$P = a + b + c$	$A = \frac{bh}{2}$ or $A = \frac{1}{2}bh$
<p>Trapezoid</p> 	$P = a + b + c + d$	$A = \frac{(a + b)h}{2}$ or $A = \frac{1}{2}(a + b)h$
<p>Circle</p> 	$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$

Geometric Figure	Surface Area	Volume
Cylinder 	$A_{\text{base}} = \pi r^2$ $A_{\text{lateral surface}} = 2\pi r h$ $A_{\text{total}} = A_{2 \text{ bases}} + A_{\text{lateral surface}}$ $= 2\pi r^2 + 2\pi r h$	$V = (A_{\text{base}})(\text{height})$ $V = \pi r^2 h$
Sphere 	$A = 4\pi r^2$	$V = \frac{4}{3} \pi r^3$ or $V = \frac{4\pi r^3}{3}$
Cone 	$A_{\text{lateral surface}} = \pi r s$ $A_{\text{base}} = \pi r^2$ $A_{\text{total}} = A_{\text{lateral surface}} + A_{\text{base}}$ $= \pi r s + \pi r^2$	$V = \frac{(A_{\text{base}})(\text{height})}{3}$ $V = \frac{1}{3} \pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$
Square-based pyramid 	$A_{\text{triangle}} = \frac{1}{2} b s$ $A_{\text{base}} = b^2$ $A_{\text{total}} = A_{4 \text{ triangles}} + A_{\text{base}}$ $= 2bs + b^2$	$V = \frac{(A_{\text{base}})(\text{height})}{3}$ $V = \frac{1}{3} b^2 h$ or $V = \frac{b^2 h}{3}$
Rectangular prism 	$A = 2(wh + lw + lh)$	$V = (\text{area of base})(\text{height})$ $V = lwh$
Triangular prism 	$A_{\text{base}} = \frac{1}{2} b l$ $A_{\text{rectangles}} = ah + bh + ch$ $A_{\text{total}} = A_{\text{rectangles}} + A_{2 \text{ bases}}$ $= ah + bh + ch + bl$	$V = (A_{\text{base}})(\text{height})$ $V = \frac{1}{2} b l h$ or $V = \frac{b l h}{2}$

Academic

Grade 9 Assessment of Mathematics

Winter 2009

SAMPLE ASSESSMENT QUESTIONS

**Record your answers to the multiple-choice questions
on the blank Student Answer Sheet (Winter 2009, Academic).**

Education Quality and
Accountability Office

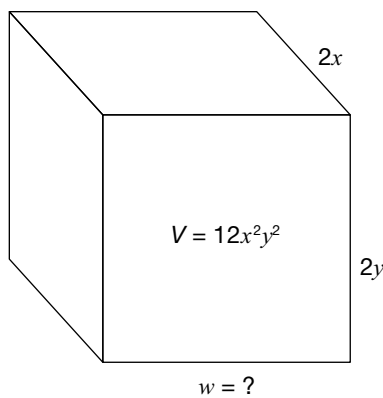


Please note: The format of
this booklet is different from
that used for the assessment.
The items themselves remain
the same.

1 What is the value of $(x^2)^3$ when $x = \frac{1}{2}$?

- a $\frac{1}{4}$
- b $\frac{1}{12}$
- c $\frac{1}{32}$
- d $\frac{1}{64}$

2 A box with a volume of $12x^2y^2$ is shown below.

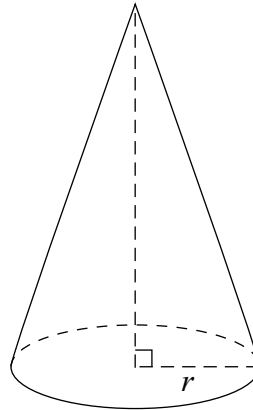


Hint: $V = lwh$

What is the width of the box?

- a $2xy$
- b $3xy$
- c $4x^3y^3$
- d $8x^3y^3$

3 The cone shown below is 20 cm high and has a total volume of 1000 cm^3 .



Which of the following is closest to the length of the radius, r ?

- a 6.9 cm
- b 6.2 cm
- c 4.0 cm
- d 2.3 cm

4 Alfredo and his wife, Jody, work in a restaurant.

Last week Alfredo received an average of \$15 in tips for each of the 55 tables he served. Jody received an average of \$20 in tips for each of the 60 tables she served.

They are planning a weekend trip. Alfredo will pay a total of \$220 for their hotel room and Jody will pay a total of \$160 for their rental car.

How much of their combined tips will be left over after they have paid for their hotel room and rental car?

- a \$1620
- b \$1645
- c \$2025
- d \$2405

5 CD Sell-Off

Juan belongs to a CD club that sells CDs for \$11.44 each before tax. His first shipment of CDs costs \$90.49 including 13% tax.

How many CDs are in his first shipment?

Show your work.



- 6** Which table of values represents a linear relation?

a

x	y
1	$\frac{1}{3}$
2	$\frac{2}{3}$
3	1
4	$\frac{4}{3}$

b

x	y
0	5
5	7
10	10
15	14

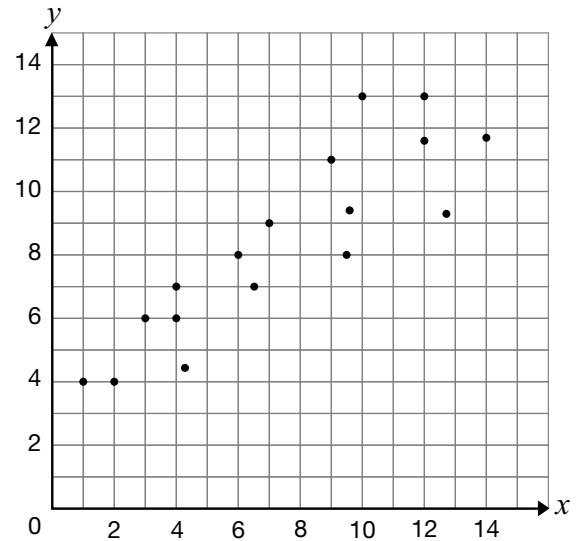
c

x	y
1	2
2	4
3	8
4	16

d

x	y
0	$\frac{1}{2}$
5	$\frac{1}{4}$
10	$\frac{1}{6}$
15	$\frac{1}{8}$

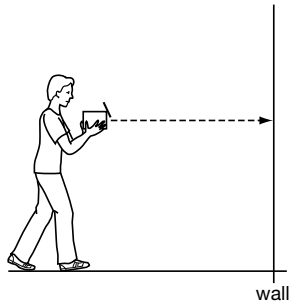
- 7** Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?



- a** -2
b -1
c 1
d 2

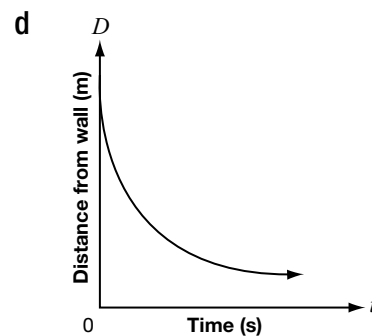
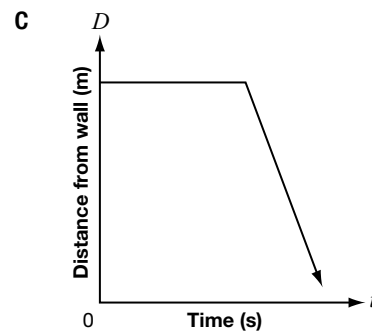
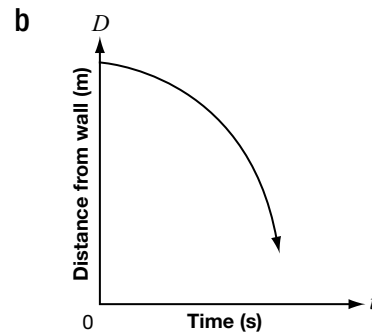
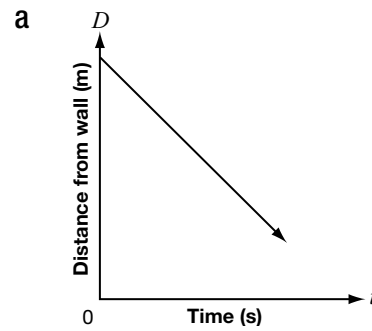


- 8** In an investigation, a student holds a motion detector, points it at a wall and walks toward the wall.



The student walks slowly at first and then speeds up as he approaches the wall.

Which of the following graphs would be produced on the graphing calculator?



- 9** The table of values below displays the cost of renting a bicycle.

Time, t (h)	Cost, C (\$)
0	25
1	30
2	35
3	40

Which equation models the cost of renting a bicycle?

- a $C = 5t$
- b $C = 25t$
- c $C = 5t + 25$
- d $C = 25t + 5$



10 Picture Perfect

The cost of producing a family photo album is \$0.50 per photo, plus a fixed cost for the album. Circle the table below that represents this scenario.

Option 1

Number of photos, p	Cost, C
5	\$2.50
10	\$5.00
15	\$7.50
20	\$10.00

Option 2

Number of photos, p	Cost, C
5	\$35.50
10	\$36.00
15	\$36.50
20	\$37.00

Option 3

Number of photos, p	Cost, C
5	\$37.50
10	\$40.00
15	\$42.50
20	\$45.00

Justify your choice and include an explanation of why you did not choose the other options.



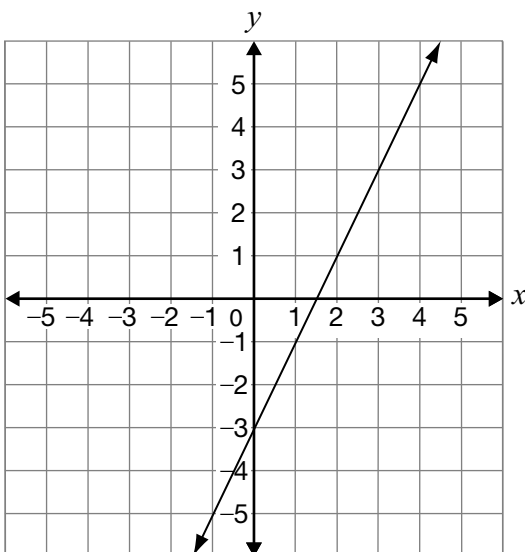
- 11** Which of the following statements is true for the line $5x - 2y - 12 = 0$?

- a The slope is $\frac{2}{5}$ and the y -intercept is 12.
- b The slope is -5 and the y -intercept is 6.
- c The slope is 5 and the y -intercept is -12 .
- d The slope is $\frac{5}{2}$ and the y -intercept is -6 .

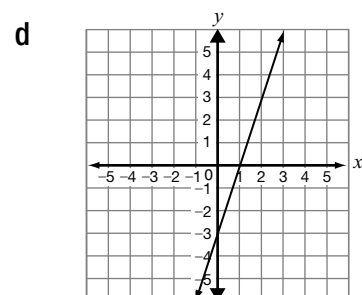
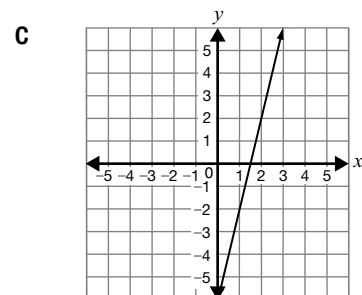
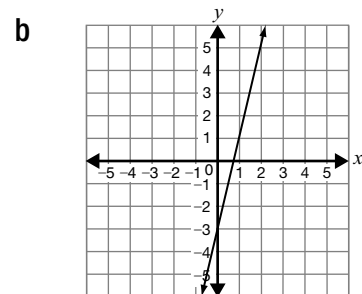
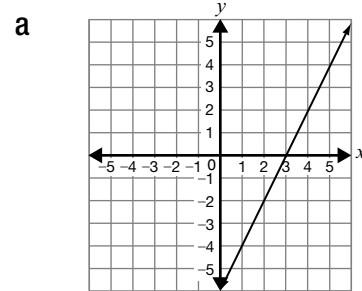
- 12** For the slope of a line, the change in x is greater than the change in y . Which of the following could represent the slope of this line?

- a $\frac{4}{3}$
- b 2
- c 1
- d $\frac{2}{5}$

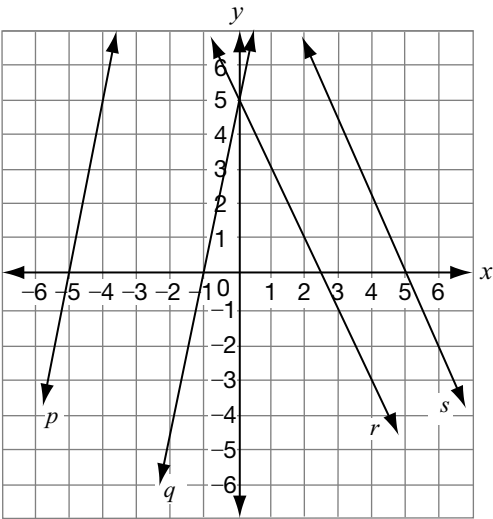
- 13** The graph of a line is shown below.



If the slope is doubled and the y -intercept remains constant, which graph below best represents the new line?



- 14** Consider the following linear relations.



Which line represents the graph of the equation $y = -2x + 5$?

- a Line p
 - b Line q
 - c Line r
 - d Line s
- 15** The following table shows values for a linear relation.

x	y
-15	-33
-9	-25
3	-9
12	3

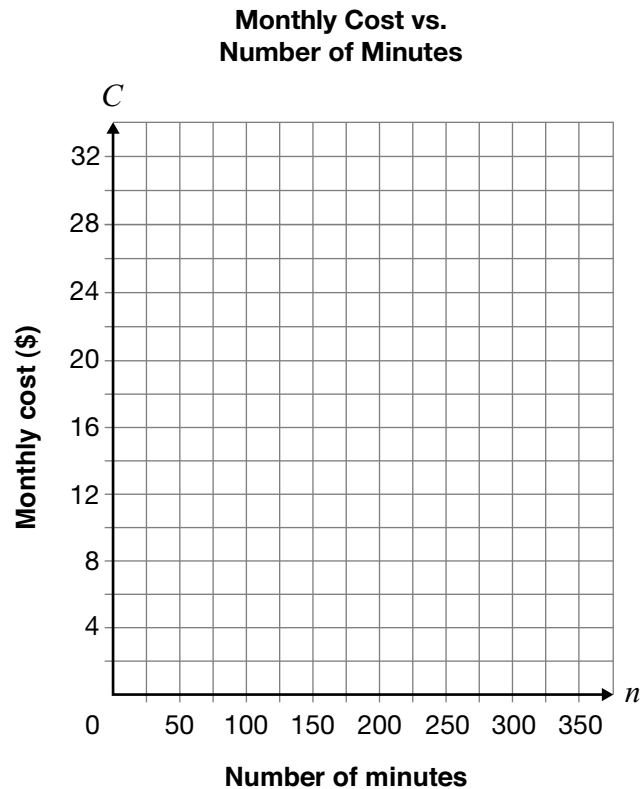
Which of the following equations represents the relationship shown in the table of values?

- a $y = \frac{4}{3}x - 16$
- b $y = \frac{4}{3}x - 13$
- c $y = \frac{3}{4}x - 9$
- d $y = \frac{3}{4}x - 6$



16 Cellphone Plans

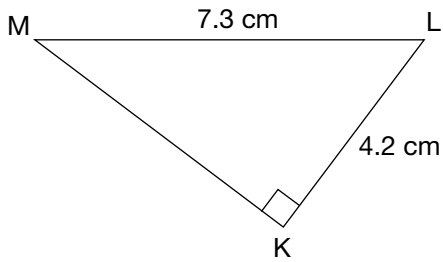
Serge is choosing a cellphone plan and wants the lowest cost. Cell-a-Bration charges \$12 per month plus \$0.05 per minute for cellphone service. E-Phone charges \$28 per month for unlimited minutes.



Determine under which conditions Serge should choose Cell-a-Bration and under which conditions Serge should choose E-Phone.

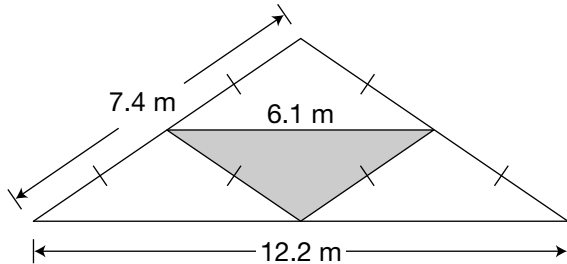
Justify your answer.

- 17** Triangle KLM is shown below.



Which of the following is closest to the perimeter of triangle KLM?

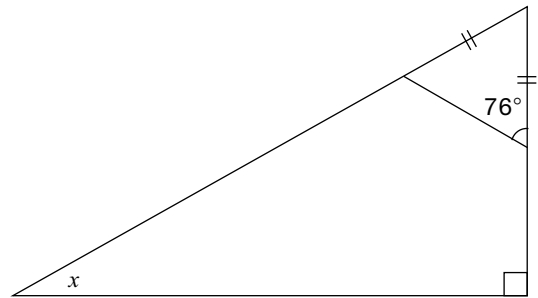
- a 12.6 cm
 - b 16.3 cm
 - c 17.5 cm
 - d 21.0 cm
- 18** The frame of the roof of a small house is being constructed. A portion of the frame consists of four isosceles triangles as shown below.



What is the total length of the three sides that form the shaded interior triangle?

- a 3.7 m
- b 6.1 m
- c 13.5 m
- d 18.3 m

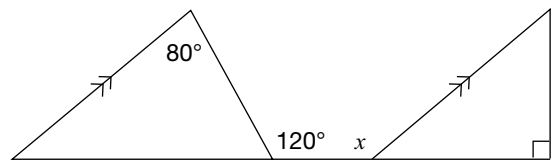
- 19** Consider the following diagram.



What is the value of x ?

- a 14°
- b 28°
- c 62°
- d 76°

- 20** Consider the diagram below.

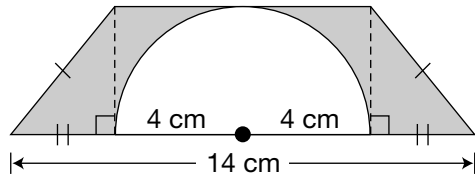


What is the value of x ?

- a 80°
- b 120°
- c 140°
- d 170°

21 Something's Missing

The semicircle in the diagram below has a radius of 4 cm.



What is the area of the shaded region?

Show your work.

**Education Quality and
Accountability Office**



2 Carlton Street, Suite 1200, Toronto ON M5B 2M9

Telephone: 1-888-327-7377 Web site: www.eqao.com

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Sample Assessment Questions: Academic

Student Answer Sheet

Enter your multiple-choice answers on this sheet.

- To indicate your answer, use an **HB pencil to fill in the circle completely**, as shown below:

Like this: ● **Not like this:** ⊗ ✓ ◐ ○

- If you fill in more than one answer to a question, the question will be scored incorrect.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. (a) (b) (c) (d)
2. (a) (b) (c) (d)
3. (a) (b) (c) (d)
4. (a) (b) (c) (d)
5. Respond in booklet.

6. (a) (b) (c) (d)
7. (a) (b) (c) (d)
8. (a) (b) (c) (d)
9. (a) (b) (c) (d)
10. Respond in booklet.

11. (a) (b) (c) (d)
12. (a) (b) (c) (d)
13. (a) (b) (c) (d)
14. (a) (b) (c) (d)
15. (a) (b) (c) (d)

16. Respond in booklet.
17. (a) (b) (c) (d)
18. (a) (b) (c) (d)
19. (a) (b) (c) (d)
20. (a) (b) (c) (d)
21. Respond in booklet.

End of Assessment

Print Student Name: _____

Student Signature: _____

Academic

Grade 9 Assessment of Mathematics

Spring 2009

SAMPLE ASSESSMENT QUESTIONS

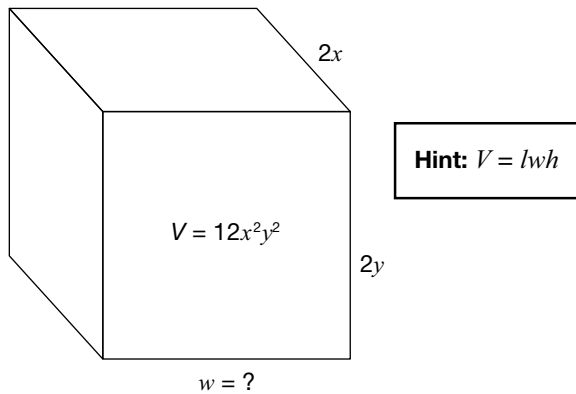
**Record your answers to the multiple-choice questions
on the blank Student Answer Sheet (Spring 2009, Academic).**

Education Quality and
Accountability Office



Please note: The format of
this booklet is different from
that used for the assessment.
The items themselves remain
the same.

- 1** A box with a volume of $12x^2y^2$ is shown below.



What is the width of the box?

- a $2xy$
 - b $3xy$
 - c $4x^3y^3$
 - d $8x^3y^3$
- 2** Which of the following is equivalent to the expression below?

$$(4x - 5) + (2x + 1)$$

- a $2x - 6$
- b $2x - 4$
- c $6x - 6$
- d $6x - 4$

- 3** Alfredo and his wife, Jody, work in a restaurant.

Last week Alfredo received an average of \$15 in tips for each of the 55 tables he served. Jody received an average of \$20 in tips for each of the 60 tables she served.

They are planning a weekend trip. Alfredo will pay a total of \$220 for their hotel room and Jody will pay a total of \$160 for their rental car.

How much of their combined tips will be left over after they have paid for their hotel room and rental car?

- a \$1620
- b \$1645
- c \$2025
- d \$2405

4 Keepin' Tabs

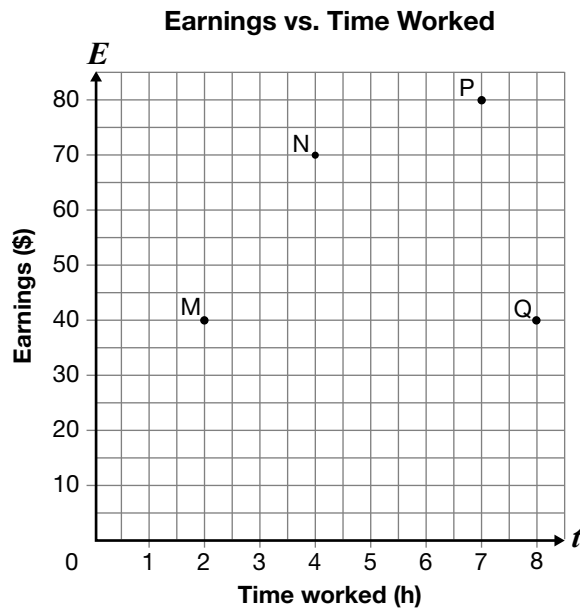
A student council collects aluminum pop tabs to raise money to purchase a wheelchair. A company buys the pop tabs for \$0.88 per kilogram.

If 1267 pop tabs have a mass of one pound, how many pop tabs are needed to purchase a wheelchair worth \$1500?

Show your work.

Hint: $1 \text{ kilogram} = 2.2 \text{ pounds}$ 

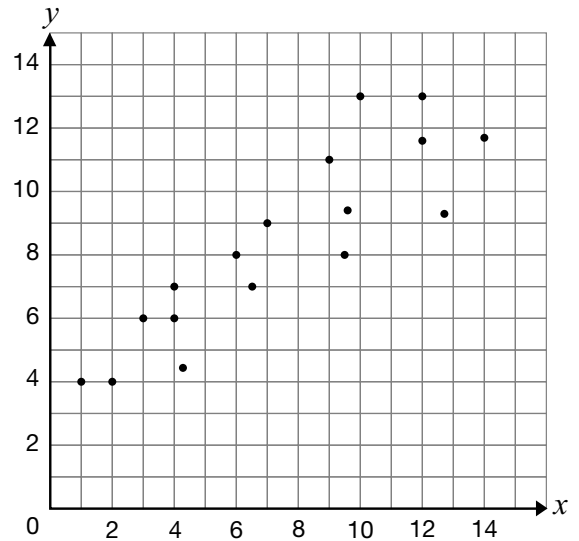
- 5** The graph below represents the relationship between earnings and time worked.



Which of the following points represents the highest rate of pay?

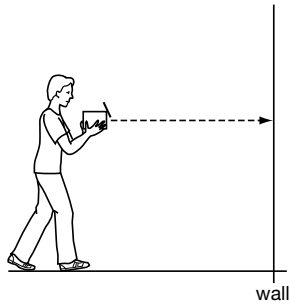
- a M
- b N
- c P
- d Q

- 6** Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?



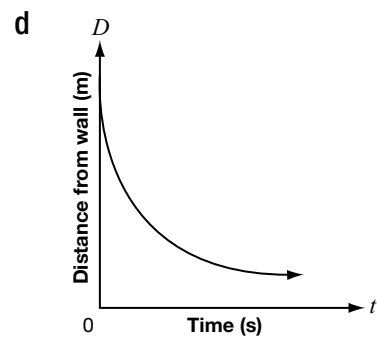
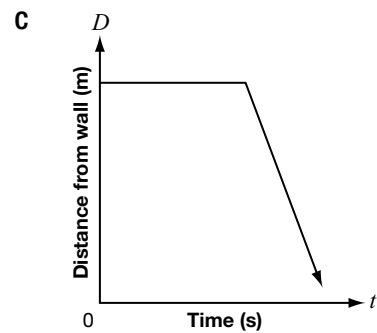
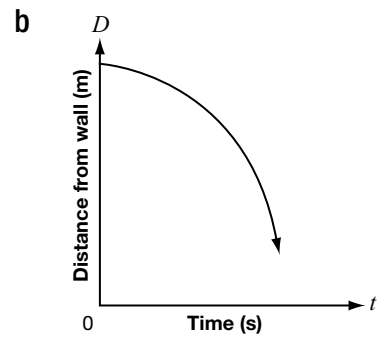
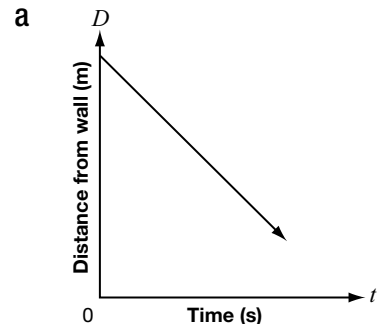
- a -2
- b -1
- c 1
- d 2

- 7** In an investigation, a student holds a motion detector, points it at a wall and walks toward the wall.



The student walks slowly at first and then speeds up as he approaches the wall.

Which of the following graphs would be produced on the graphing calculator?



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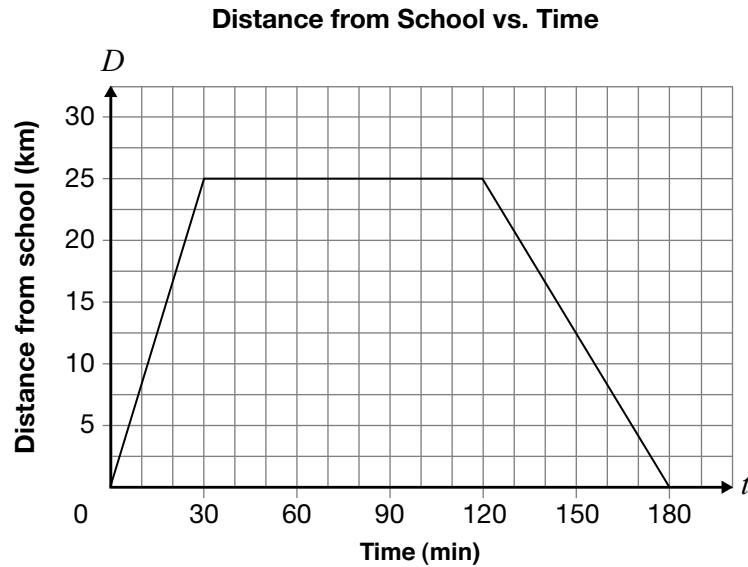
Which equation models the cost of renting a bicycle?

- a $C = 5t$
- b $C = 25t$
- c $C = 5t + 25$
- d $C = 25t + 5$



9 Dogs Versus Cats

The Bryant Bulldogs basketball team takes the bus to play the Jordan High Thundercats.



Describe the three parts of the Bulldogs' bus trip, using the information on the graph.

Include information about distance, time, direction and speed in kilometres per minute for each section of the graph.

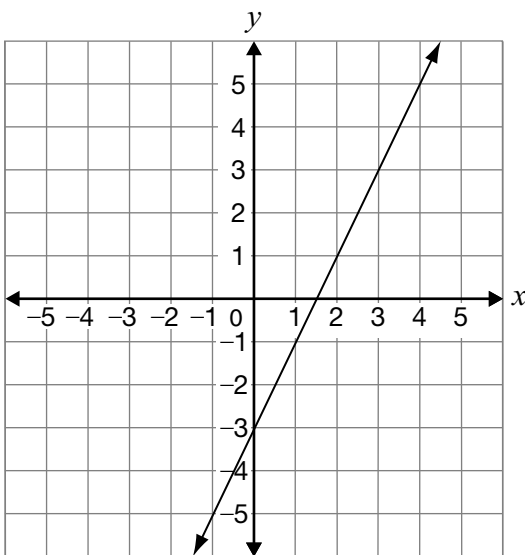
10 Which of the following equations does **not** represent a linear relation?

- a $x = -2$
- b $y = 3x - 1$
- c $y = x^2 + 3$
- d $3x - 2y - 1 = 0$

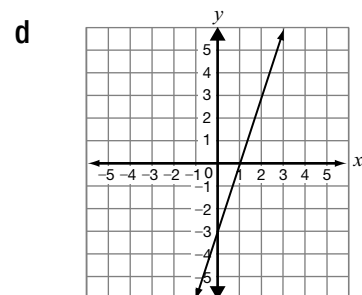
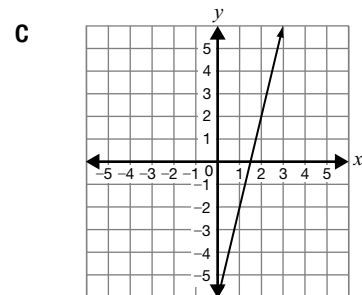
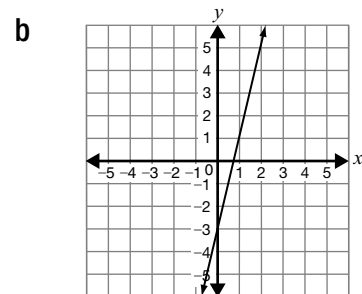
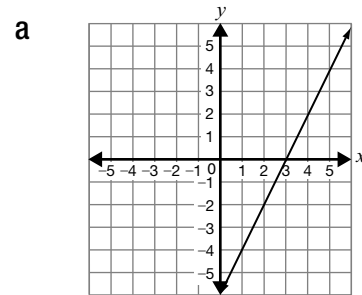
11 For the slope of a line, the change in x is greater than the change in y . Which of the following could represent the slope of this line?

- a $\frac{4}{3}$
- b 2
- c 1
- d $\frac{2}{5}$

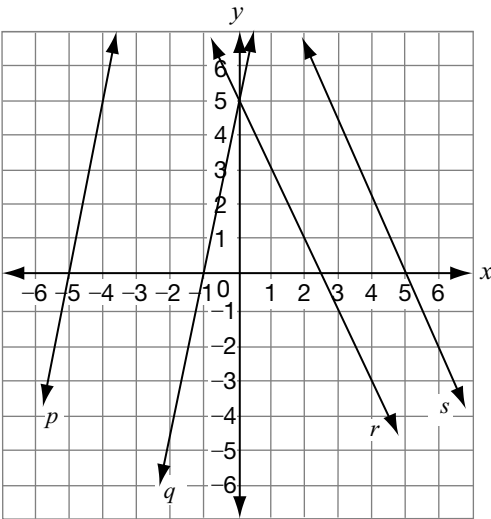
12 The graph of a line is shown below.



If the slope is doubled and the y -intercept remains constant, which graph below best represents the new line?



- 13** Consider the following linear relations.



Which line represents the graph of the equation $y = -2x + 5$?

- a Line p
 - b Line q
 - c Line r
 - d Line s
- 14** The following table shows values for a linear relation.

x	y
-15	-33
-9	-25
3	-9
12	3

Which of the following equations represents the relationship shown in the table of values?

- a $y = \frac{4}{3}x - 16$
- b $y = \frac{4}{3}x - 13$
- c $y = \frac{3}{4}x - 9$
- d $y = \frac{3}{4}x - 6$



15 A Tale of Two Lines

Below are the equations of two lines.

Line A: $x - 2y + 8 = 0$

Line B: $2x + y + 1 = 0$

Compare the two lines by considering their slopes.

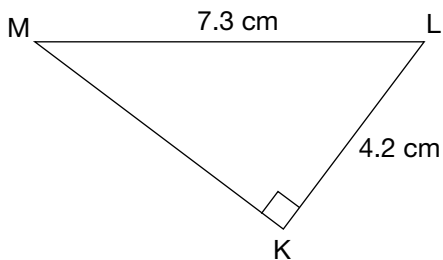
Justify your answer.

Hint:

Include information about

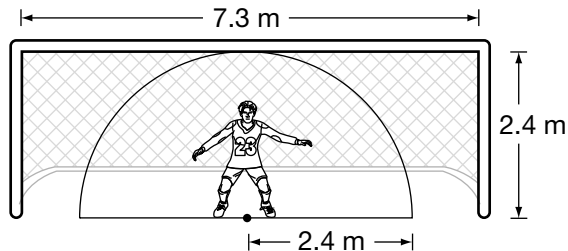
- steepness,
- direction and
- whether the lines are parallel or perpendicular, or whether they are neither.

- 16** Triangle KLM is shown below.



Which of the following is closest to the perimeter of triangle KLM?

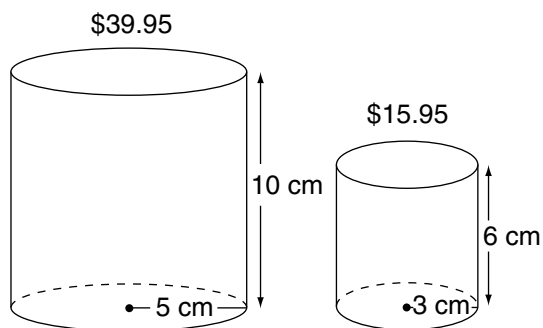
- a 12.6 cm
 - b 16.3 cm
 - c 17.5 cm
 - d 21.0 cm
- 17** A soccer goalie is standing in a goal opening. From this position, she can guard the area represented by the semicircle below.



How much of the goal opening is she not guarding?

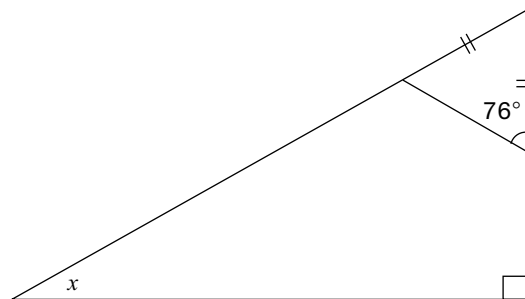
- a 0.6 m^2
- b 8.5 m^2
- c 9.0 m^2
- d 26.6 m^2

- 18** Two different stores sell coffee in cylindrical packages. The prices and dimensions of the packages from the two stores are shown below.



Which is closest to the difference between the unit prices of these two packages?

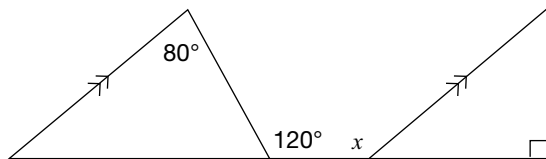
- a $\$0.04/\text{cm}^3$
 - b $\$0.05/\text{cm}^3$
 - c $\$0.09/\text{cm}^3$
 - d $\$0.24/\text{cm}^3$
- 19** Consider the following diagram.



What is the value of x ?

- a 14°
- b 28°
- c 62°
- d 76°

- 20** Consider the diagram below.



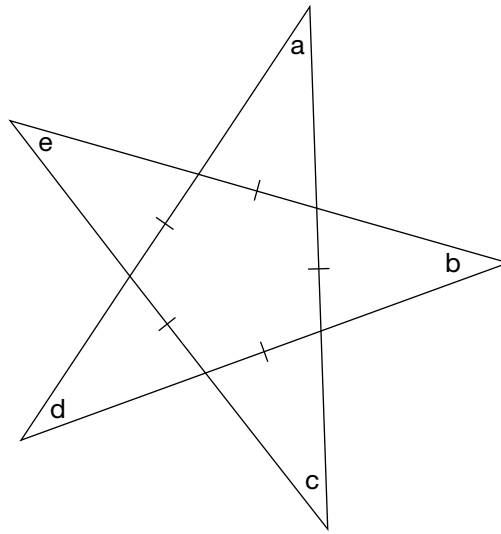
What is the value of x ?

- a 80°
- b 120°
- c 140°
- d 170°



21 Twinkle Twinkle

Nicole notices the star design shown below on the pavement outside a movie theatre.



Determine the sum of the angle measures in the corners of this star: $a + b + c + d + e$.

Justify your answer using geometric properties.

Sample Assessment Questions: Academic

Student Answer Sheet

Enter your multiple-choice answers on this sheet.

- To indicate your answer, use an **HB pencil to fill in the circle completely**, as shown below:

Like this: ● **Not like this:** ⊗ ✓ ◐ ○

- If you fill in more than one answer to a question, the question will be scored incorrect.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. (a) (b) (c) (d)

2. (a) (b) (c) (d)

3. (a) (b) (c) (d)

4. Respond in booklet.

5. (a) (b) (c) (d)

6. (a) (b) (c) (d)

7. (a) (b) (c) (d)

8. (a) (b) (c) (d)

9. Respond in booklet.

10. (a) (b) (c) (d)

11. (a) (b) (c) (d)

12. (a) (b) (c) (d)

13. (a) (b) (c) (d)

14. (a) (b) (c) (d)

15. Respond in booklet.

16. (a) (b) (c) (d)

17. (a) (b) (c) (d)

18. (a) (b) (c) (d)

19. (a) (b) (c) (d)

20. (a) (b) (c) (d)

21. Respond in booklet.

End of Assessment

Print Student Name: _____

Student Signature: _____

Academic

Grade 9 Assessment of Mathematics

Winter 2008

SAMPLE ASSESSMENT QUESTIONS

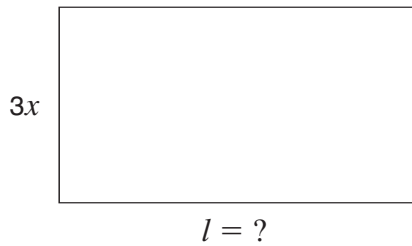
**Record your answers to the multiple-choice questions
on the blank Student Answer Sheet (Winter 2008, Academic).**

Education Quality and
Accountability Office



Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

- 1** The area of the rectangle shown below is $6xy^2$ square units.



Hint: $A = lw$

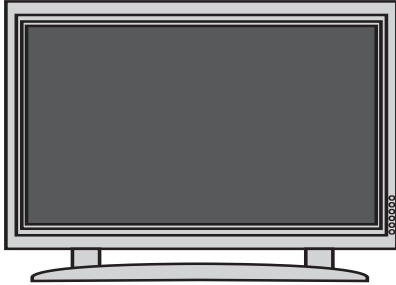
If the width is $3x$ units, which expression represents the length of the rectangle?

- a $2xy^2$ units
 - b $2y^2$ units
 - c $3xy^2$ units
 - d $3y^2$ units
- 2** The expression below can be simplified.
- $$\frac{(x^2y)^3}{(xy)^2}$$
- Which of the following shows the expression in its simplest form?
- a x^4y
 - b x^4
 - c xy
 - d x^3y
- 3** Josie works in a sports store. She receives 8% of the total sales each day. One day, she receives \$35 for her portion of the total sales. What are the total sales for that day?
- a \$37.80
 - b \$43.75
 - c \$280.00
 - d \$437.50
- 4** Which of the following represents the expression $2(3x + 4) + 3(x - 1)$ in a simplified form?
- a $9x + 3$
 - b $9x + 5$
 - c $8x + 8$
 - d $8x + 11$



5 Competing Sales

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at \$599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at \$899.99 and is on sale for 30% off the regular price.

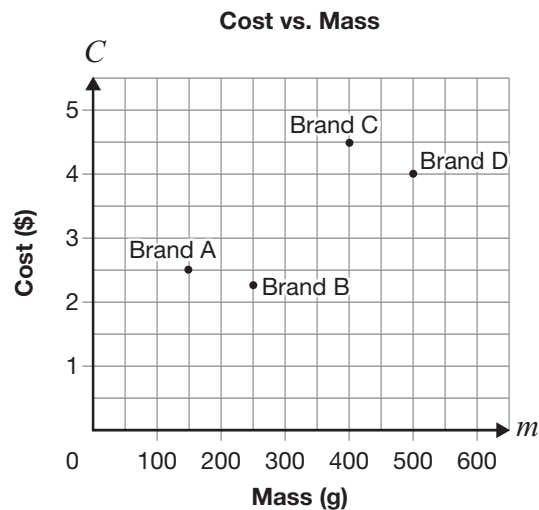


What is the difference in the sale price of the TV between these two stores?

Show your work.



- 6** The following graph shows the relationship between the mass and the cost of four different brands of strawberry jam.



Which statement is true?

- a Brand A has the lowest cost.
- b Brand B has the smallest mass.
- c Brand C has the highest cost per gram.
- d Brand D has the lowest cost per gram.

- 7** Gerry has a table of values representing a linear relation. Two of the numbers are hidden behind a ketchup spill.

x	y
-2	-6
-1	
0	
1	18

The values that are hidden are

- a -2 and 14.
- b 0 and 12.
- c 2 and 10.
- d 3 and 9.

- 8** Nadia lives 11.4 km from school and rides her bike to school every day.

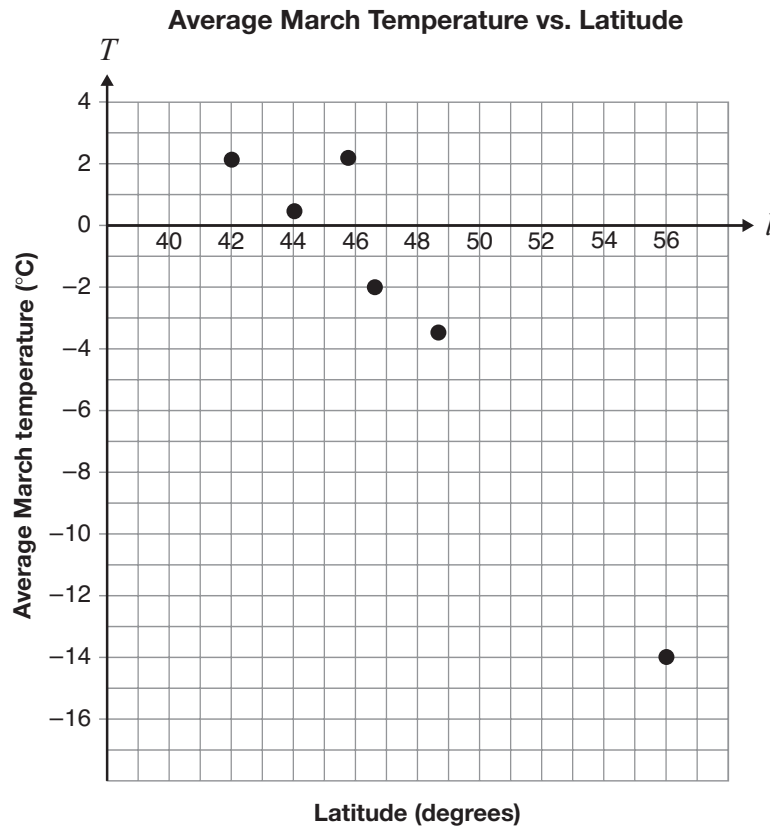
The equation $d = 11.4 - 0.6t$ represents the relationship between d , her distance from school in km, and t , her time spent travelling in minutes.

If she leaves home at 8:05 a.m., what time will she get to school?

- a 8:11 a.m.
- b 8:16 a.m.
- c 8:17 a.m.
- d 8:24 a.m.

9 March Temperatures

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of -6.3°C . Does the community of Kenora follow the trend of the data?

Justify your answer.

- 10** The table below shows examples of linear and non-linear equations.

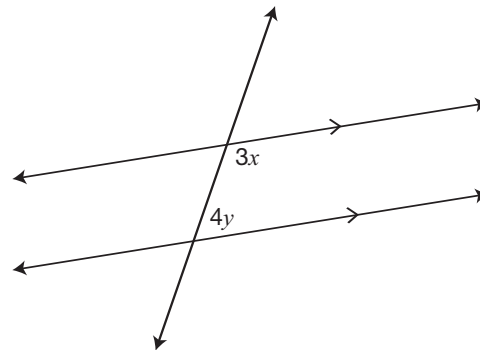
Equation Examples

Linear equations	Non-linear equations
$y = 5x - 3$	$y = 5x^2 - 3$
$y = 125 - 4.25x$	$y = 2x^3$
$y = -3x$	$2x^2 + 5y^2 = 10$

Which of these statements best describes how linear equations are different from non-linear equations in the table above?

- a The exponent of both variables in the linear equations is 1.
- b The exponent of exactly one variable in the linear equations is 1.
- c The exponent of both variables in the non-linear equations is 1.
- d The exponent of exactly one variable in the non-linear equations is 1.

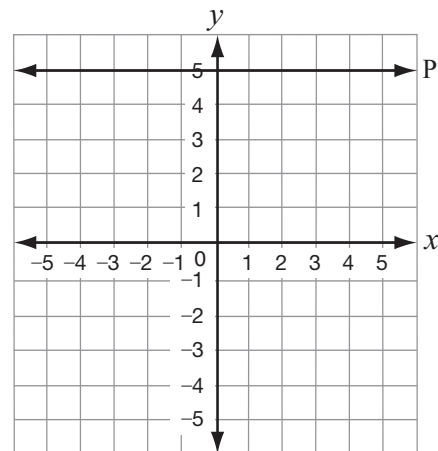
- 11** The relation shown below can be expressed as $3x + 4y - 180 = 0$.



Another way to write this relation is

- a $y = \frac{3}{4}x - 45$.
- b $y = -\frac{3}{4}x + 45$.
- c $y = -\frac{4}{3}x + 60$.
- d $y = \frac{4}{3}x - 60$.

- 12** Line P is shown below.



Which equation represents Line P?

- a $x = 5$
- b $y = 5$
- c $y = x + 5$
- d $x = y + 5$

- 13** What is the equation of the line that passes through the points (2, 4) and (4, 0)?

- a** $y = -\frac{1}{2}x + 2$
- b** $y = -\frac{1}{2}x + 5$
- c** $y = -2x + 4$
- d** $y = -2x + 8$

- 14** Identical bottles are packed in a box. The box will hold a maximum of 38 bottles. The relationship between M , the total mass of the box and its contents, and n , the number of bottles in the box, is represented by the equation $M = 500n + 800$.

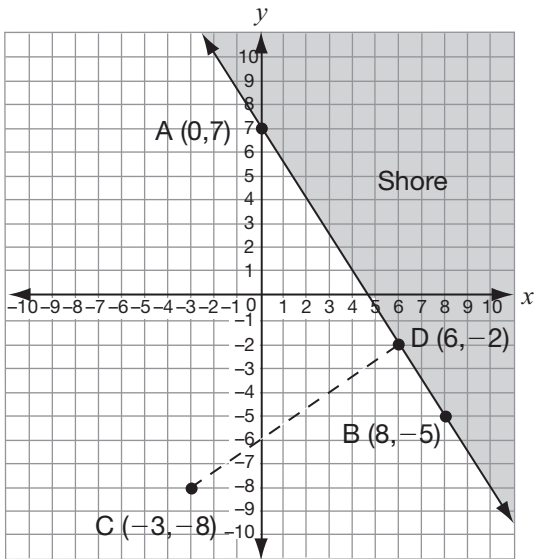
Which of the following are possible integer values for the variable n ?

- a** n is greater than 37.
- b** n is greater than or equal to 0.
- c** n is greater than 0 but less than 39.
- d** n is greater than or equal to 0 but less than 39.



15 Washed Up on the Shore

A boat is travelling from Point C toward Point D, which is on the shoreline. The shoreline is represented by the line through points A and B.



Determine whether the path from C to D is perpendicular to the shoreline. Justify your answer.

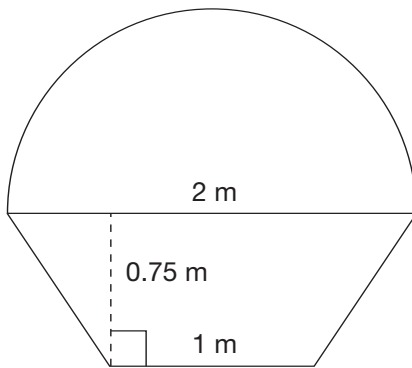


- 16** Maria grows several varieties of plants in a rectangular-shaped garden. She uses fencing to divide the garden into 16 squares that are each 1 m by 1 m. She also puts fencing around the perimeter of the garden.

Which of the following represents the smallest amount of fencing that Maria needs?

- a 24 m
- b 40 m
- c 42 m
- d 49 m

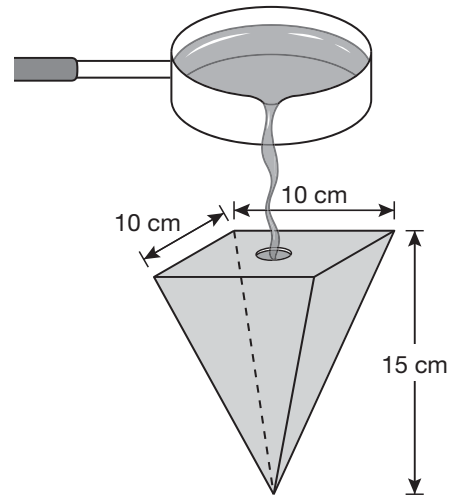
- 17** The Cutie Cupcake Company is having a sign made. The sign will be a semicircle on top of a trapezoid.



Which of the following is closest to the total area of the sign?

- a 4.27 m^2
- b 2.70 m^2
- c 1.57 m^2
- d 1.13 m^2

- 18** The mould shown below is used to make a candle in the shape of a square-based pyramid.



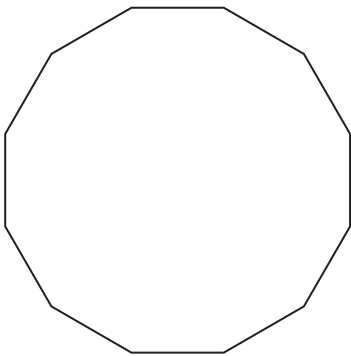
What is the volume of the mould?

- a 1500 cm^3
- b 500 cm^3
- c 400 cm^3
- d 35 cm^3

- 19** If the radius of a sphere is tripled, the surface area of the sphere will increase

- a by a factor of 3.
- b by a factor of 4.
- c by a factor of 6.
- d by a factor of 9.

- 20** What is the measure, in degrees, of the sum of the interior angles of a 12-sided regular polygon?

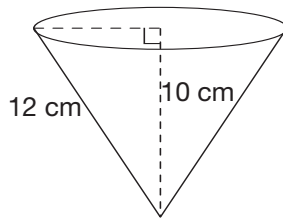


- a 2160°
- b 1800°
- c 1500°
- d 1080°



21 Cone Zone

Zach measures the slant height of a cone-shaped cup and finds that it is 12 cm. The height is 10 cm.



Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

Sample Assessment Questions: Academic

Student Answer Sheet

Enter your multiple-choice answers on this sheet.

- To indicate your answer, use an **HB pencil to fill in the circle completely**, as shown below:

Like this: ● **Not like this:** ⊗ ✓ ◐ ○

- If you fill in more than one answer to a question, the question will be scored incorrect.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. (a) (b) (c) (d)
2. (a) (b) (c) (d)
3. (a) (b) (c) (d)
4. (a) (b) (c) (d)
5. Respond in booklet.

6. (a) (b) (c) (d)
7. (a) (b) (c) (d)
8. (a) (b) (c) (d)
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12. (a) (b) (c) (d)
13. (a) (b) (c) (d)
14. (a) (b) (c) (d)
15. Respond in booklet.

16. (a) (b) (c) (d)
17. (a) (b) (c) (d)
18. (a) (b) (c) (d)
19. (a) (b) (c) (d)
20. (a) (b) (c) (d)
21. Respond in booklet.

End of Assessment

Print Student Name: _____

Student Signature: _____

Academic

Grade 9 Assessment of Mathematics

Spring 2008

SAMPLE ASSESSMENT QUESTIONS

**Record your answers to the multiple-choice questions
on the blank Student Answer Sheet (Spring 2008, Academic).**

Education Quality and
Accountability Office



Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

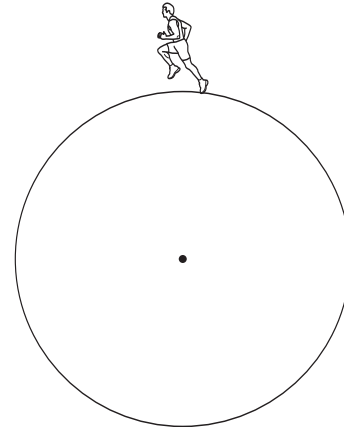
- 1** The expression below can be simplified.

$$\frac{(x^2y)^3}{(xy)^2}$$

Which of the following shows the expression in its simplest form?

- a x^4y
 - b x^4
 - c xy
 - d x^3y
- 2** Josie works in a sports store. She receives 8% of the total sales each day. One day, she receives \$35 for her portion of the total sales. What are the total sales for that day?
- a \$37.80
 - b \$43.75
 - c \$280.00
 - d \$437.50
- 3** Which of the following represents the expression $2(3x + 4) + 3(x - 1)$ in a simplified form?
- a $9x + 3$
 - b $9x + 5$
 - c $8x + 8$
 - d $8x + 11$

- 4** The distance covered in 5 laps of a circular track is 400π metres.

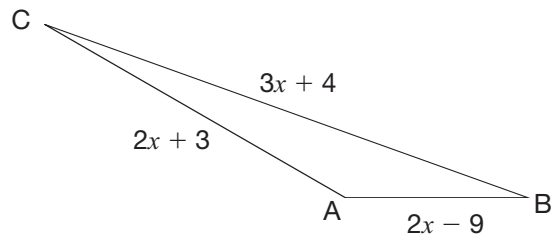


What is the shortest distance between any point on the track and the centre?

- a 400 m
- b 200 m
- c 80 m
- d 40 m

5 What Side?

The perimeter of the triangle below is 75 m.

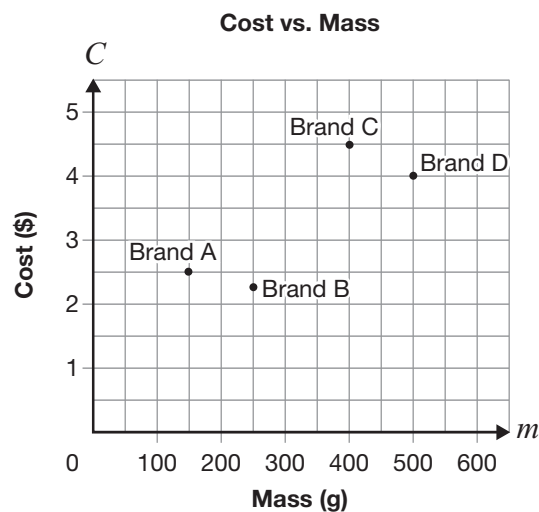


Determine the measure of each side of the triangle.

Show your work.



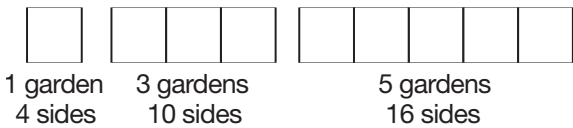
- 6** The following graph shows the relationship between the mass and the cost of four different brands of strawberry jam.



Which statement is true?

- a Brand A has the lowest cost.
- b Brand B has the smallest mass.
- c Brand C has the highest cost per gram.
- d Brand D has the lowest cost per gram.

- 7** Square gardens are arranged side by side as shown below.



Which table of values represents the relationship between the number of gardens and the number of sides?

a

Number of gardens	Number of sides
1	4
2	8
3	12
4	16
5	20

b

Number of gardens	Number of sides
1	4
2	5
3	10
4	11
5	16

c

Number of gardens	Number of sides
1	4
2	6
3	10
4	14
5	16

d

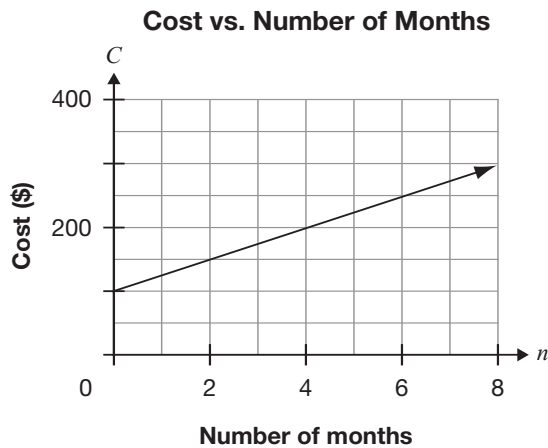
Number of gardens	Number of sides
1	4
2	7
3	10
4	13
5	16

- 8** Gerry has a table of values representing a linear relation. Two of the numbers are hidden behind a ketchup spill.

x	y
-2	-6
-1	
0	
1	18

The values that are hidden are

- a -2 and 14.
 - b 0 and 12.
 - c 2 and 10.
 - d 3 and 9.
- 9** The graph below represents the cost to belong to a local gym.



Which equation represents the graph?

- a $C = \frac{1}{25}n + 100$
- b $C = \frac{1}{2}n + 100$
- c $C = 2n + 100$
- d $C = 25n + 100$



10 Wing Length

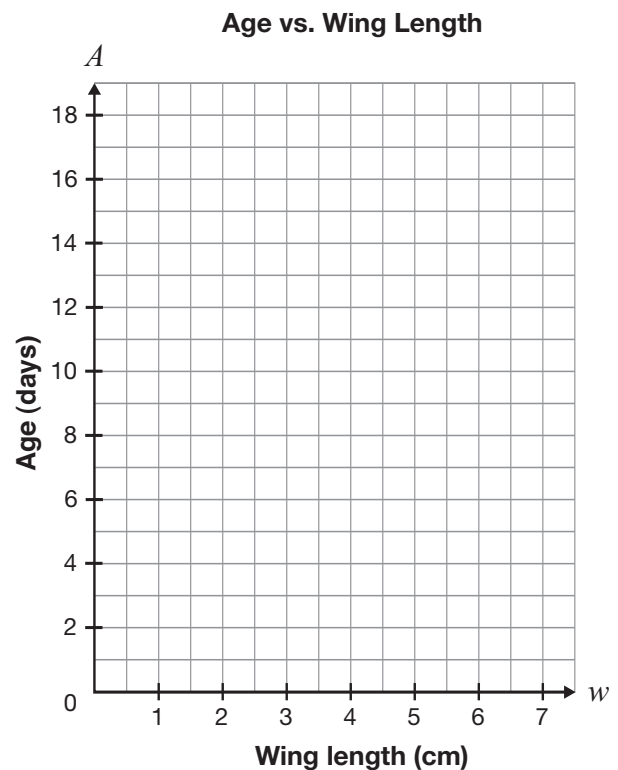
Wing length is a reliable method for determining the age of young birds. Below is an example of data for a particular species.

Wing length (cm)	Age (days)
1.5	4
3.1	8
3.2	10
4.1	12
5.2	16

Determine the age of a bird with a wing length of 3.6 cm.

You may use the grid if you wish.

Justify your answer.



- 11** The table below shows examples of linear and non-linear equations.

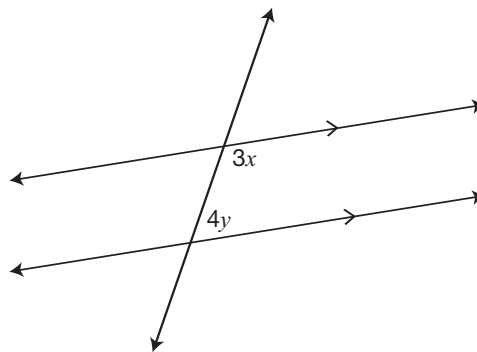
Equation Examples

Linear equations	Non-linear equations
$y = 5x - 3$	$y = 5x^2 - 3$
$y = 125 - 4.25x$	$y = 2x^3$
$y = -3x$	$2x^2 + 5y^2 = 10$

Which of these statements best describes how linear equations are different from non-linear equations in the table above?

- a The exponent of both variables in the linear equations is 1.
- b The exponent of exactly one variable in the linear equations is 1.
- c The exponent of both variables in the non-linear equations is 1.
- d The exponent of exactly one variable in the non-linear equations is 1.

- 12** The relation shown below can be expressed as $3x + 4y - 180 = 0$.



Another way to write this relation is

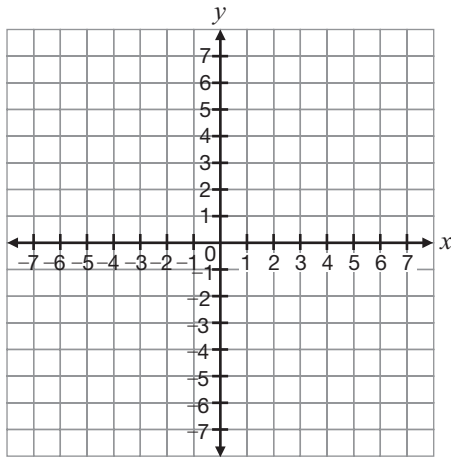
- a $y = \frac{3}{4}x - 45$.
- b $y = -\frac{3}{4}x + 45$.
- c $y = -\frac{4}{3}x + 60$.
- d $y = \frac{4}{3}x - 60$.

- 13** How would the graph of the relation $y = 3x - 2$ change if the 3 and -2 were both doubled?

The graph would be

- a steeper and have a lower y -intercept.
- b steeper and have a higher y -intercept.
- c less steep and have a lower y -intercept.
- d less steep and have a higher y -intercept.

- 14** Consider the points A(1, 4), B(6, 3), C(−1, 5), D(−3, 0) and E(2, −1).



Which line segment is parallel to AB?

- a AE
- b BE
- c CE
- d DE

- 15** Identical bottles are packed in a box. The box will hold a maximum of 38 bottles. The relationship between M , the total mass of the box and its contents, and n , the number of bottles in the box, is represented by the equation $M = 500n + 800$.

Which of the following are possible integer values for the variable n ?

- a n is greater than 37.
- b n is greater than or equal to 0.
- c n is greater than 0 but less than 39.
- d n is greater than or equal to 0 but less than 39.



16 Excellent Equations

A line is perpendicular to the line $y = 2x + 3$ and has the same **x-intercept** as $x + 3y + 10 = 0$.

Find the equation of this line. Express your answer in the form $y = mx + b$.

Justify your answer.

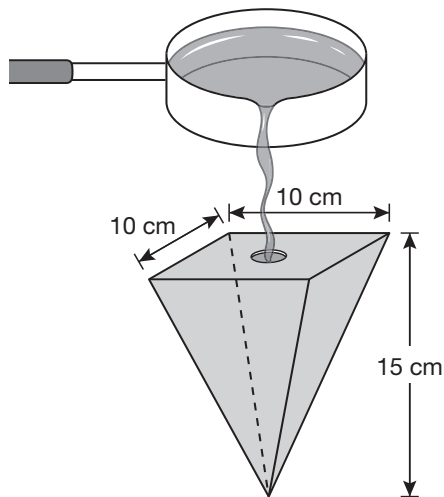


- 17** Maria grows several varieties of plants in a rectangular-shaped garden. She uses fencing to divide the garden into 16 squares that are each 1 m by 1 m. She also puts fencing around the perimeter of the garden.

Which of the following represents the smallest amount of fencing that Maria needs?

- a 24 m
- b 40 m
- c 42 m
- d 49 m

- 18** The mould shown below is used to make a candle in the shape of a square-based pyramid.



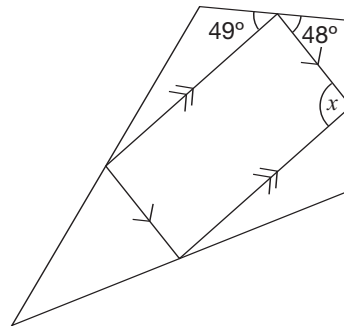
What is the volume of the mould?

- a 1500 cm^3
- b 500 cm^3
- c 400 cm^3
- d 35 cm^3

- 19** If the radius of a sphere is tripled, the surface area of the sphere will increase

- a by a factor of 3.
- b by a factor of 4.
- c by a factor of 6.
- d by a factor of 9.

- 20** A parallelogram is inscribed in a quadrilateral as shown.

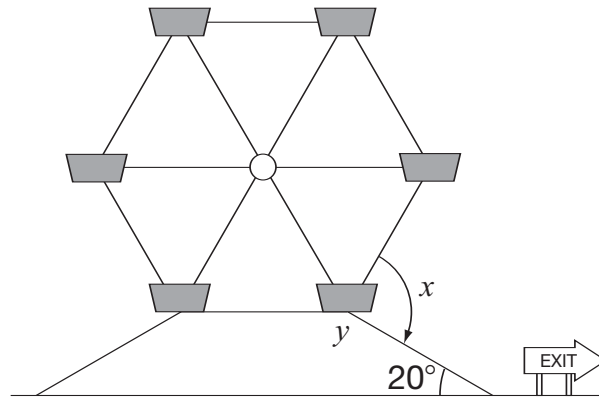


What is the value of x ?

- a 48°
- b 49°
- c 83°
- d 97°

21 Wheels of Fun

A Ferris wheel has six sides of equal length. The exit ramp of the Ferris wheel is in the shape of a trapezoid and has an angle of incline of 20° .



What are the values of x and y ?

Use geometric properties to justify your answer.

Sample Assessment Questions: Academic

Student Answer Sheet

Enter your multiple-choice answers on this sheet.

- To indicate your answer, use an **HB pencil to fill in the circle completely**, as shown below:

Like this: ● **Not like this:** ⊗ ✓ ◐ ○

- If you fill in more than one answer to a question, the question will be scored incorrect.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. (a) (b) (c) (d)

2. (a) (b) (c) (d)

3. (a) (b) (c) (d)

4. (a) (b) (c) (d)

5. Respond in booklet.

6. (a) (b) (c) (d)

7. (a) (b) (c) (d)

8. (a) (b) (c) (d)

9. (a) (b) (c) (d)

10. Respond in booklet.

11. (a) (b) (c) (d)

12. (a) (b) (c) (d)

13. (a) (b) (c) (d)

14. (a) (b) (c) (d)

15. (a) (b) (c) (d)

16. Respond in booklet.

17. (a) (b) (c) (d)

18. (a) (b) (c) (d)

19. (a) (b) (c) (d)

20. (a) (b) (c) (d)

21. Respond in booklet.

End of Assessment

Print Student Name: _____

Student Signature: _____

Academic

Grade 9 Assessment of Mathematics

Winter 2007

SAMPLE ASSESSMENT QUESTIONS

Circle the best answer for each multiple choice question on the page.

Answer each open response question in the space provided.

Education Quality and
Accountability Office



Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

- 1** Meg has been asked to determine the value of the numerical expression below.

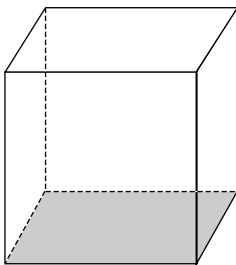
$$\frac{2^{400}}{2^{396}} - 2^3$$

Which of the following is the value of Meg's expression?

- A 1
- B 2
- C 4
- D 8

- 2** Expressions for the base area and volume of a prism are given below.

$$\text{Volume} = 64a^3b^6$$

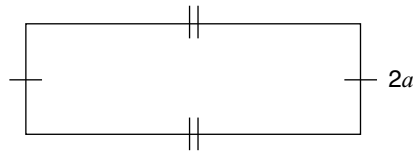


$$\text{Base area} = 16ab^3$$

Which expression represents the height of the prism?

- F $4a^2b^3$
- G $4a^3b^3$
- H $1024a^3b^9$
- J $1024a^4b^9$

- 3** A rectangular field has a **perimeter** of $(10a - 6)$ metres and a width of $2a$ metres.



Which expression represents the **length** of this field?

- A $8a - 6$
- B $12a - 6$
- C $3a - 3$
- D $3a^2 - 3$

- 4** Which value of x satisfies the equation $5 - 2x = 9$?

- F $x = -7$
- G $x = -2$
- H $x = 2$
- J $x = 3$

5 Sales Goals

Alexis works part-time at a clothing store. She is paid an hourly rate of \$10.25/h and also earns a commission of 3.5% of her total weekly sales.

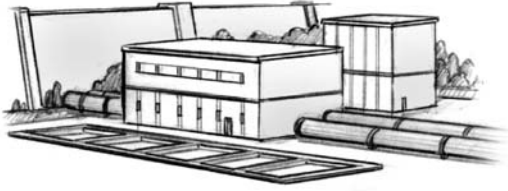
Alexis works at the store 12 hours a week.

If Alexis's goal is to earn \$150 every week, what do her total weekly sales need to be?

Show your work.

- 6** The charges on a monthly water bill are \$0.86 per m^3 of water used plus a service charge of \$4.49.

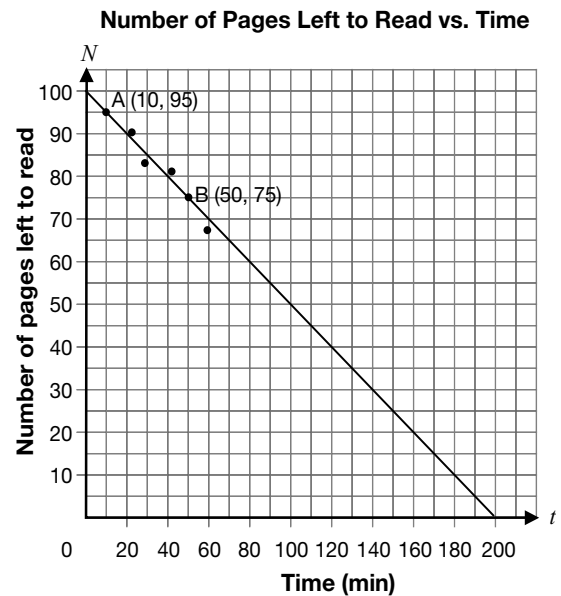
Let C = total charge, in dollars, and
 w = total amount of water used, in m^3 .



Which equation represents the relationship between C and w ?

- F** $C = 4.49 \times 0.86w$
G $C = 4.49w + 0.86$
H $C = 4.49 + 0.86w$
J $C = (4.49 + 0.86)w$

- 7** The following scatter plot shows the relationship between N , the number of pages in Annie's textbook that she has left to read, and t , the time in minutes she spends reading the book.



Which equation represents the line above?

- A** $N = -\frac{1}{2}t + 100$
B $N = -\frac{1}{2}t + 200$
C $N = -t + 100$
D $N = -t + 200$

- 8** Temira needs to rent a car. She considers the following price equations, where C is the total cost, in dollars, and n is the number of days.

Company	Equation
Rentway	$C = 20n + 100$
Cheapie's Rentals	$C = 25n + 50$
Cars Cars Cars	$C = 50n$
Drive Away	$C = 15n + 125$

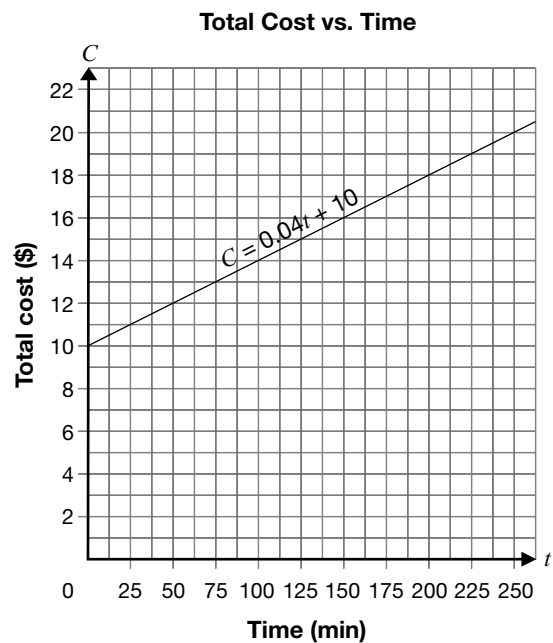
Which company should she choose if she is planning to rent the car for at least 10 days?

- F Rentway
 G Cheapie's Rentals
 H Cars Cars Cars
 J Drive Away

- 9** Two Internet service providers are competing.



The equation $C = 0.04t + 10$ represents the relationship between the total cost, C , charged by Internet Connections and the time, t .



Surf Away wants **always** to be cheaper than Internet Connections.

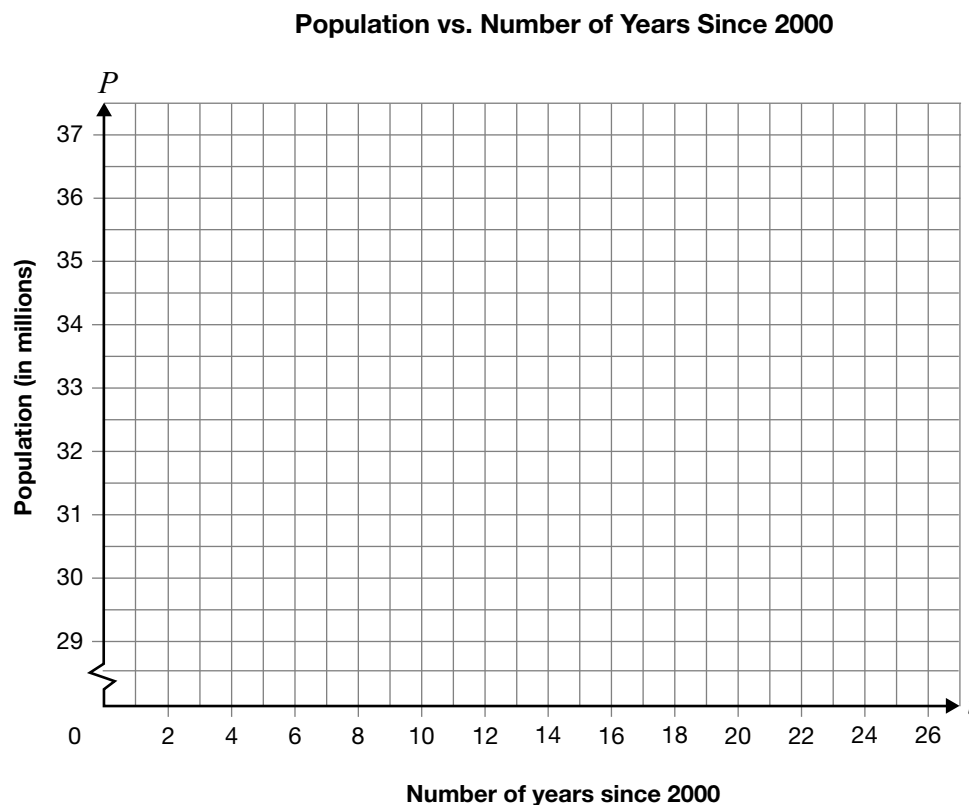
Which of the following equations represents this situation?

- A $C = 15$
 B $C = 0.02t + 11$
 C $C = 0.03t + 9$
 D $C = 0.05t + 8$

10 Population Plans

Alvin is researching the population of Canada. He finds data for the year 2001 and predictions for every 5 years after that, as shown below.

Number of years since 2000, t	Population (in millions), P
1	31.1
6	32.2
11	33.4
16	34.4
21	35.4
26	36.2



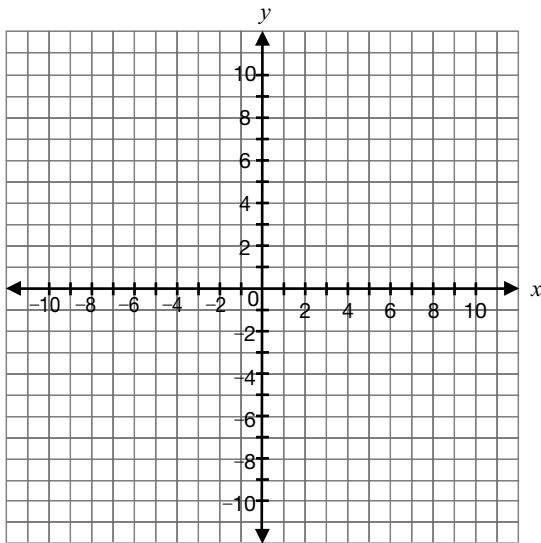
Determine an algebraic model for Alvin's data, and use it to make a reasonable prediction for the population of Canada in 2036.

Justify your answer.

- 11** Which of the following equations is **not** represented by a straight line on a graph?

A $x = 3y - 4$
 B $y = -2x$
 C $x = 4$
 D $y = 2x^2 - 2$

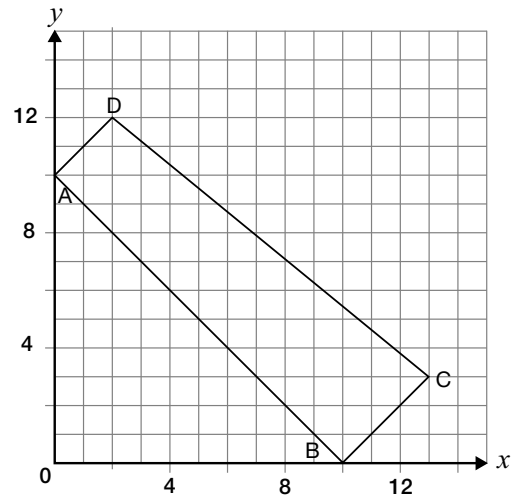
- 12** Imagine the graph for the relation $4x - 5y + 20 = 0$.



What is the **slope**?

F $\frac{4}{5}$
 G $-\frac{4}{5}$
 H $\frac{5}{4}$
 J 4

- 13** The following graph shows the quadrilateral ABCD.

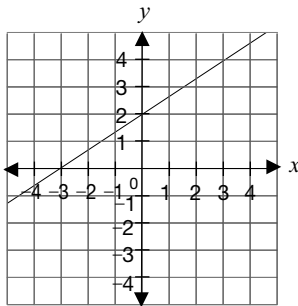


Which of the following statements is **false**?

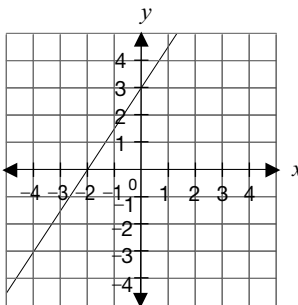
A AD is parallel to BC.
 B DC is parallel to AB.
 C CB is perpendicular to AB.
 D DA is perpendicular to AB.

- 14** Which **graph** represents the relation $y = \frac{2}{3}x + 2$?

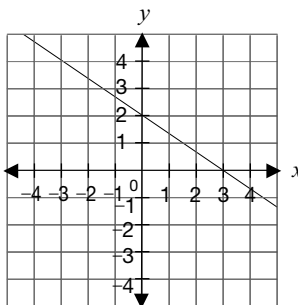
F



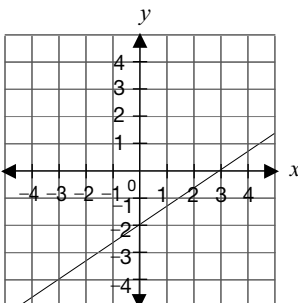
G



H



J



- 15** A line has the following characteristics.

- It is perpendicular to the line $y = \frac{1}{2}x + 3$.
- It passes through the point $(4, 0)$.

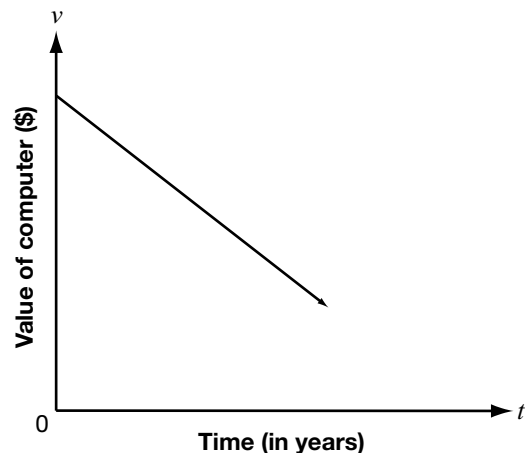
What are m , the slope, and b , the y -intercept, of the line?

- A $m = \frac{1}{2}; b = 0$
 B $m = \frac{1}{2}; b = 3$
 C $m = -2; b = 0$
 D $m = -2; b = 8$

- 16** A computer decreases in value over time. The relationship between the value of the computer, v , in dollars after t years is written as the equation

$$v = -300t + 2100.$$

A line representing the relationship is graphed.

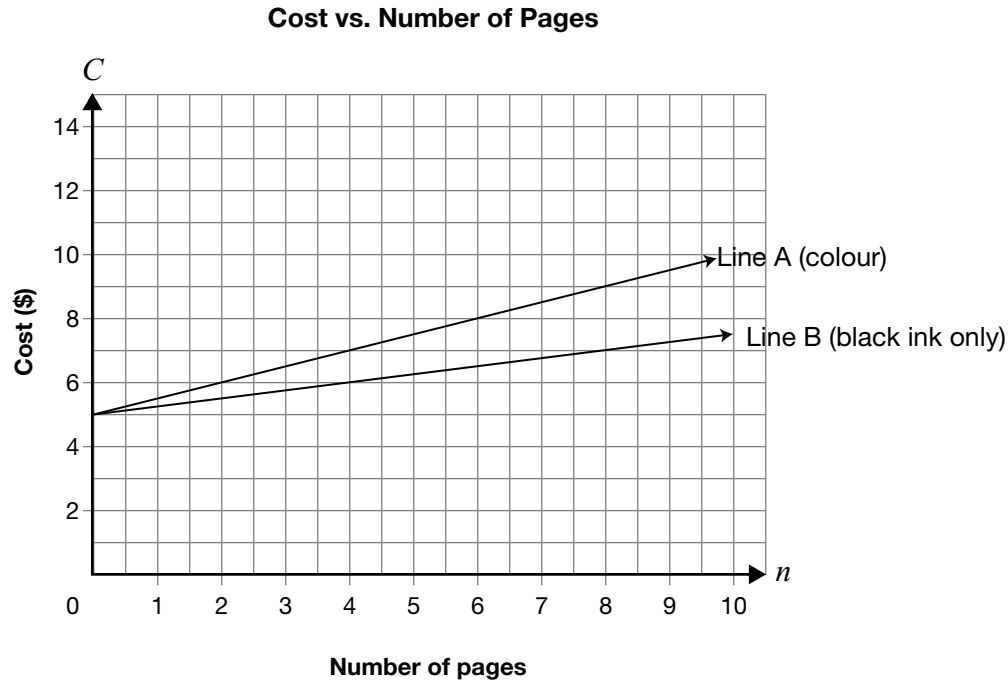


What does the v -intercept of the line represent?

- F The decrease in value per year
 G The initial value of the computer
 H The number of years until the value is \$0
 J The number of years the computer will work

17 To Colour or Not to Colour

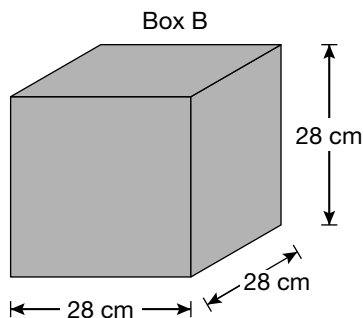
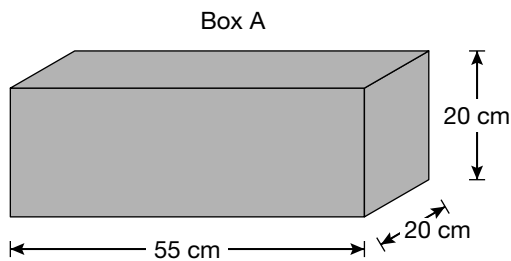
The graph below shows the cost to print a document at the Graphics Shop. Line A represents the cost of printing the document in colour. Line B represents the cost to print it with black ink only.



For a 500-page document, how much more will it cost to print in colour than with black ink only?

Show your work.

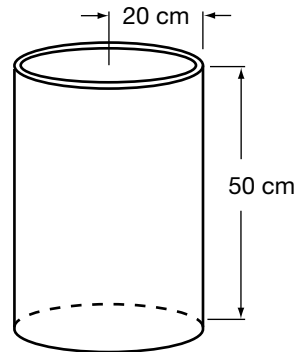
- 18** Box A and Box B have about the same volume. The cost to make a box depends on the amount of cardboard used.



Which of the following statements is correct?

- F** Box B costs less; it uses 48 cm^3 less cardboard to make.
- G** Box A costs less; it uses 290 cm^3 less cardboard to make.
- H** Box B costs less; it uses 496 cm^2 less cardboard to make.
- J** Box A costs less; it uses 496 cm^2 less cardboard to make.

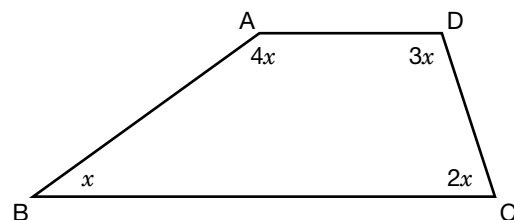
- 19** Brad has a cylindrical metal container that is open at the top. He wants to paint the outer surfaces of the container, including the bottom.



Which expression should he use to calculate the area to be painted?

- A** $\pi(20)(50) \text{ cm}^2$
- B** $2\pi(20)(50) \text{ cm}^2$
- C** $2(\pi(20)^2 + \pi(20)(50)) \text{ cm}^2$
- D** $(\pi(20)^2 + 2\pi(20)(50)) \text{ cm}^2$

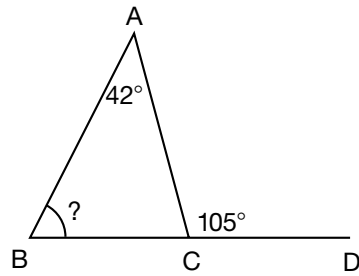
- 20** ABCD is a quadrilateral.



What is the measure of $\angle BAD$?

- F** 108°
- G** 120°
- H** 132°
- J** 144°

- 21** In the figure, BC is extended to D.
 $\angle BAC = 42^\circ$ and $\angle ACD = 105^\circ$.



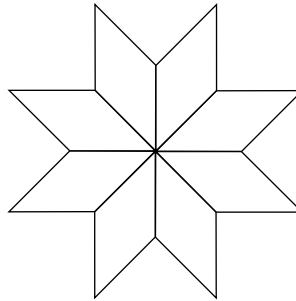
What is the value of $\angle ABC$?

- A 33°
- B 42°
- C 52°
- D 63°

22 Geometric Quilts

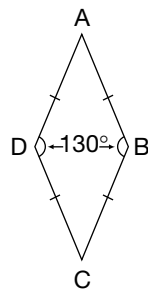
Paul's grandmother wants to use quilt pieces to make an **eight-pointed star** like the one shown.

Eight-Pointed Star



Her quilt pieces are in the shape of a rhombus with two angles of 130° .

Quilt Piece



Is it possible to make an **eight-pointed star** using copies of her quilt piece?

Justify your answer.

Academic

Grade 9 Assessment of Mathematics

Spring 2007

SAMPLE ASSESSMENT QUESTIONS

Circle the best answer for each multiple choice question on the page.

Answer each open response question in the space provided.

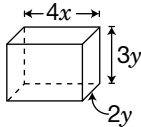
Education Quality and
Accountability Office



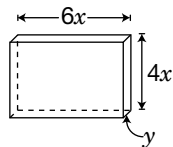
Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

- 1** Which of the following fish tanks would contain an amount of water represented by the expression $V = 24x^2y$ when completely full?

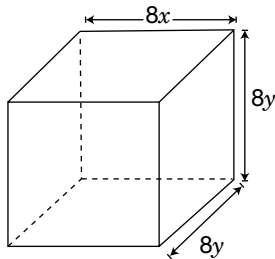
A



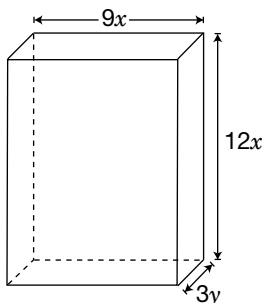
B



C



D



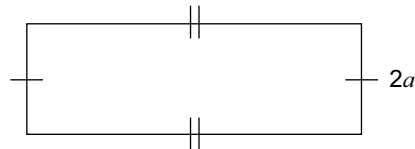
- 2** Theo plans to purchase a new long-distance telephone plan called the Silver Plan. Under this plan, the telephone company determines the monthly cost using the following charges.

- The base fee is \$30/month, which includes up to 150 minutes of long distance.
- The cost for all minutes over 150 each month is \$0.15/minute.

With the Silver Plan, how much will it cost Theo to talk long-distance for 230 minutes over one month?

- F \$12.00
G \$34.50
H \$42.00
J \$64.50

- 3** A rectangular field has a **perimeter** of $(10a - 6)$ metres and a width of $2a$ metres.



Which expression represents the **length** of this field?

- A $8a - 6$
B $12a - 6$
C $3a - 3$
D $3a^2 - 3$

4 Disc-ussion

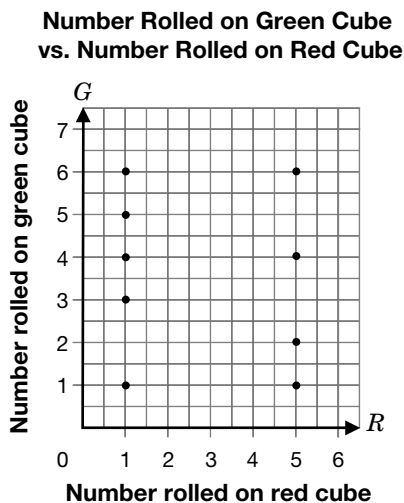
Tyler, Raven and Deb are discussing the number of CDs they each own. They find that the following statements are true:

- Tyler owns five more than twice the number of CDs Raven owns.
- Deb owns three times as many CDs as Tyler.

Using x to represent the number of CDs Raven owns, write an expression for the total number of CDs the three friends own. Show your work and simplify your answer.

- 5** For a new game, Xiao makes two numbered cubes: one green and one red. She randomly assigns numbers on the six faces of each of the cubes, **possibly** repeating some numbers.

She rolls the red and the green cubes together nine times. She displays the results in a graph.

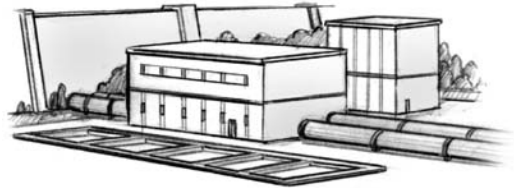


Which of the following statements does the data in the graph **most likely** suggest about the cubes?

- A** Each cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cubes' faces.
- B** Each cube has 6 distinct numbers on its faces, as no numbers are repeated on the cubes' faces.
- C** The green cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube's faces.
- D** The red cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube's faces.

- 6** The charges on a monthly water bill are \$0.86 per m^3 of water used plus a service charge of \$4.49.

Let C = total charge, in dollars, and
 w = total amount of water used, in m^3 .



Which equation represents the relationship between C and w ?

- F** $C = 4.49 \times 0.86w$
- G** $C = 4.49w + 0.86$
- H** $C = 4.49 + 0.86w$
- J** $C = (4.49 + 0.86)w$

- 7** Alex's Rose Shop makes up bouquets and charges for the vase, plus a cost per rose.

- The shop charges \$32.85 for a bouquet of 12 roses.
- The shop charges \$50.85 for a bouquet of 20 roses.

What does Alex's Rose Shop charge for a vase?

- A** \$18.00
- B** \$8.00
- C** \$5.85
- D** \$2.74

- 8** Temira needs to rent a car. She considers the following price equations, where C is the total cost, in dollars, and n is the number of days.

Company	Equation
Rentway	$C = 20n + 100$
Cheapie's Rentals	$C = 25n + 50$
Cars Cars Cars	$C = 50n$
Drive Away	$C = 15n + 125$

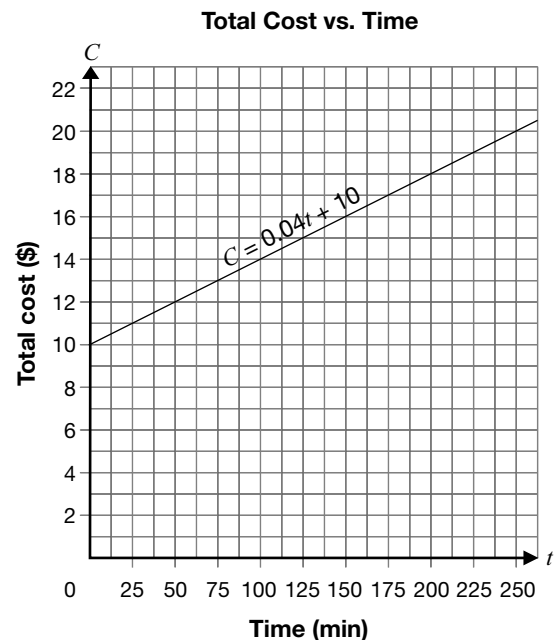
Which company should she choose if she is planning to rent the car for at least 10 days?

- F Rentway
 G Cheapie's Rentals
 H Cars Cars Cars
 J Drive Away

- 9** Two Internet service providers are competing.



The equation $C = 0.04t + 10$ represents the relationship between the total cost, C , charged by Internet Connections and the time, t .



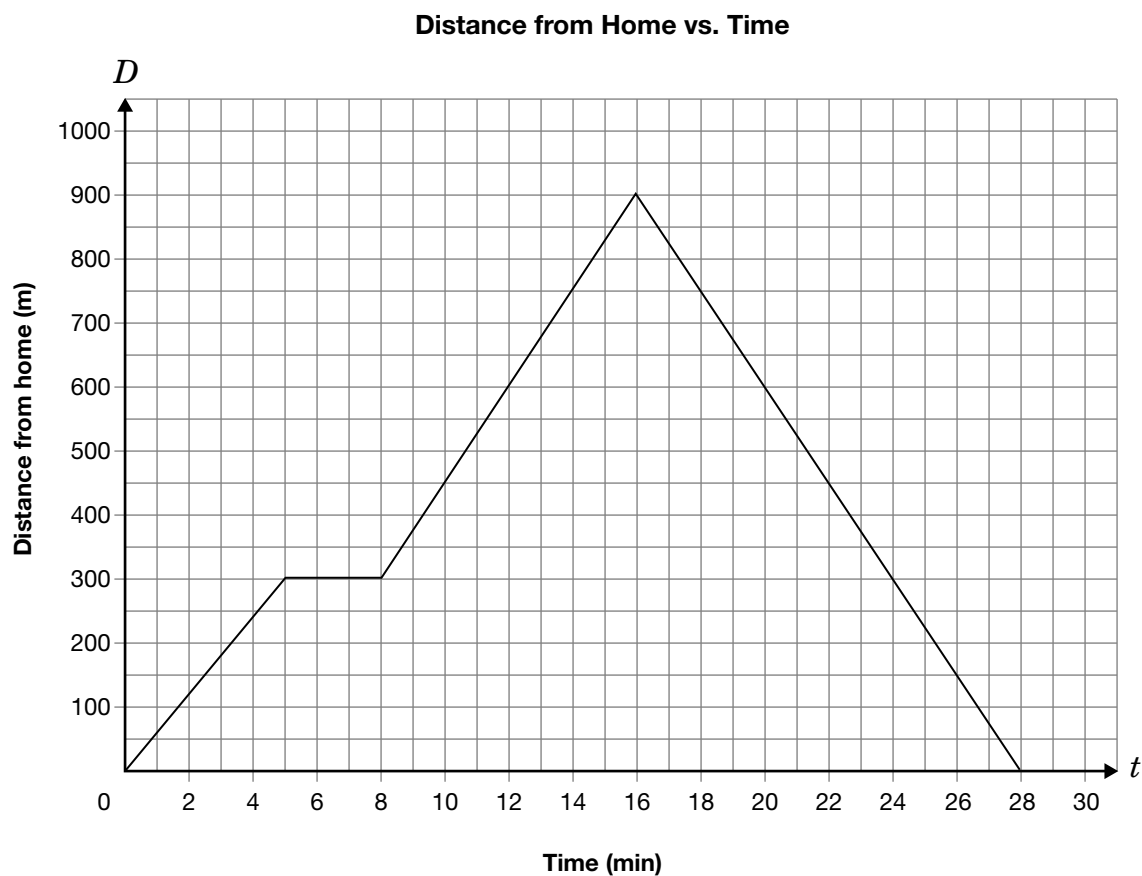
Surf Away wants **always** to be cheaper than Internet Connections.

Which of the following equations represents this situation?

- A $C = 15$
 B $C = 0.02t + 11$
 C $C = 0.03t + 9$
 D $C = 0.05t + 8$

10 Selena's Stroll

The graph below represents 4 segments of Selena's morning walk.



Describe the four segments of Selena's walk.

Hint

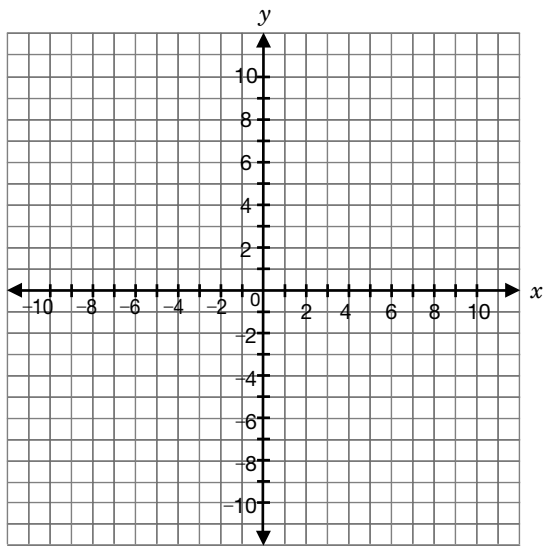
Include information about

- direction,
- distance,
- time and
- speed, in m/min.

- 11** Salazar is asked to graph the linear relation represented by $2x - 3y + 6 = 0$. What is the y -intercept of this line?

A -6
B -2
C 2
D 6

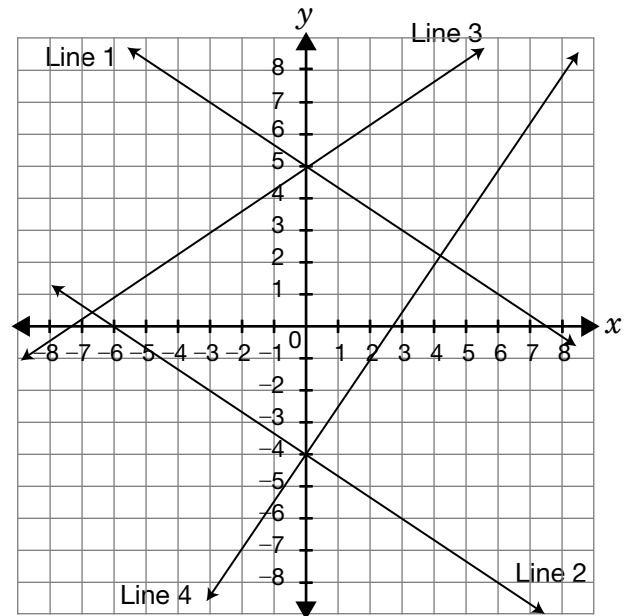
- 12** Imagine the graph for the relation $4x - 5y + 20 = 0$.



What is the **slope**?

F $\frac{4}{5}$
G $-\frac{4}{5}$
H $\frac{5}{4}$
J 4

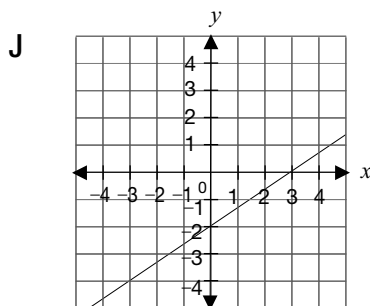
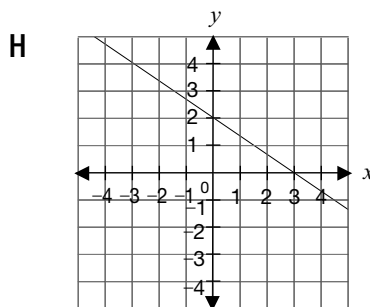
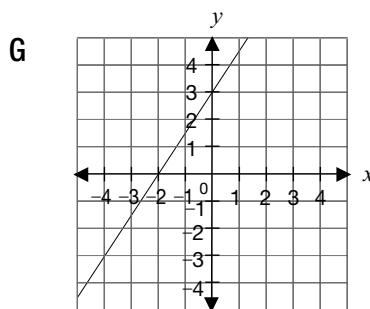
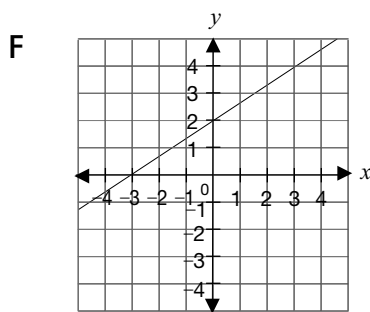
- 13** The grid below shows the graphs of four linear relations.



Which of the following matches the line with its equation?

- A Line 1: $y = -\frac{3}{2}x + 5$
B Line 2: $2x + 3y + 12 = 0$
C Line 3: $y = \frac{3}{2}x + 5$
D Line 4: $2x - 3y - 12 = 0$

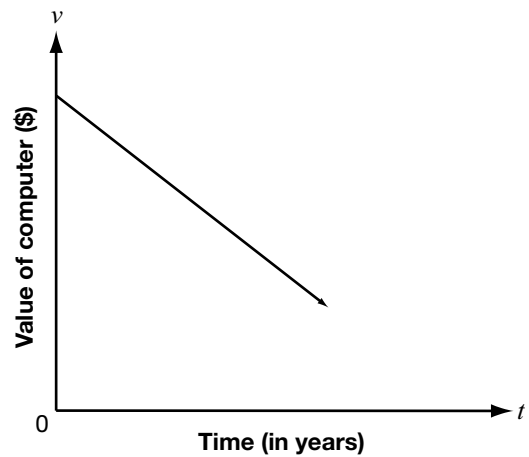
- 14** Which **graph** represents the relation $y = \frac{2}{3}x + 2$?



- 15** A computer decreases in value over time. The relationship between the value of the computer, v , in dollars after t years is written as the equation

$$v = -300t + 2100.$$

A line representing the relationship is graphed.

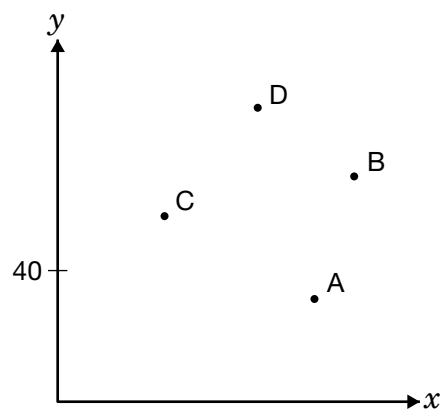


What does the v -intercept of the line represent?

- A** The decrease in value per year
- B** The initial value of the computer
- C** The number of years until the value is \$0
- D** The number of years the computer will work

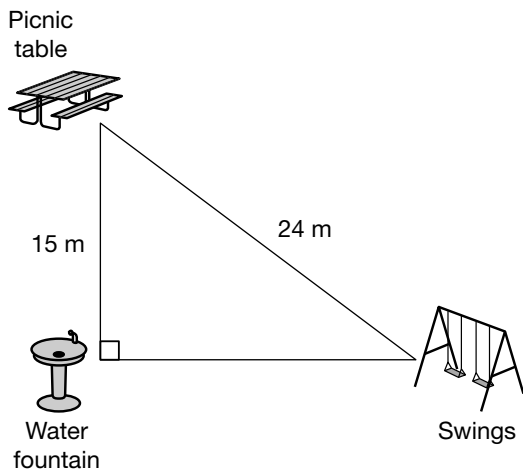
16 Lineup

The line $y = \frac{1}{5}x + 50$ passes through only one pair of points below.



Which pair of points could the line pass through? Justify your response.

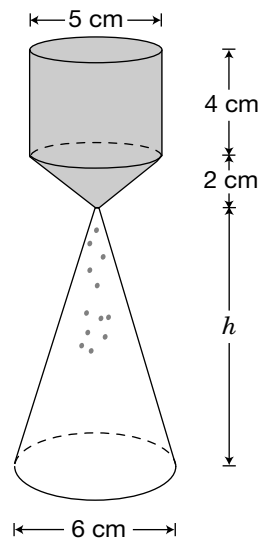
- 17** The positions of the water fountain, the picnic table and the swings at a local park are shown below.



The Pythagorean theorem was used to determine the distance, in metres, from the water fountain to the swings. Which of the following is closest to this distance?

- A 28 m
- B 19 m
- C 15 m
- D 9 m

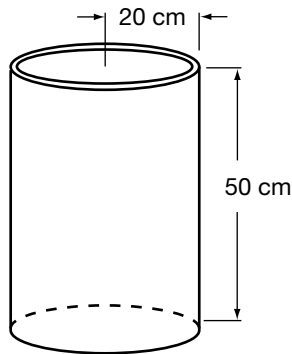
- 18** Sand is being poured from one container to another, as shown below. The sand flows from the shaded part to the unshaded cone.



The shaded part starts full of sand. The sand empties into the unshaded cone and fills it to the top. What is the height of the unshaded cone?

- F 6.0 cm
- G 8.3 cm
- H 9.7 cm
- J 12.5 cm

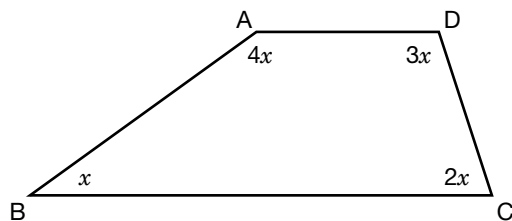
- 19** Brad has a cylindrical metal container that is open at the top. He wants to paint the outer surfaces of the container, including the bottom.



Which expression should he use to calculate the area to be painted?

- A $\pi(20)(50) \text{ cm}^2$
 B $2\pi(20)(50) \text{ cm}^2$
 C $2(\pi(20)^2 + \pi(20)(50)) \text{ cm}^2$
 D $(\pi(20)^2 + 2\pi(20)(50)) \text{ cm}^2$

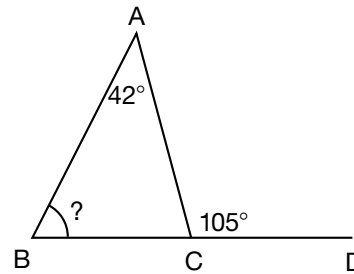
- 20** ABCD is a quadrilateral



What is the measure of $\angle BAD$?

- F 108°
 G 120°
 H 132°
 J 144°

- 21** In the figure, BC is extended to D. $\angle BAC = 42^\circ$ and $\angle ACD = 105^\circ$.

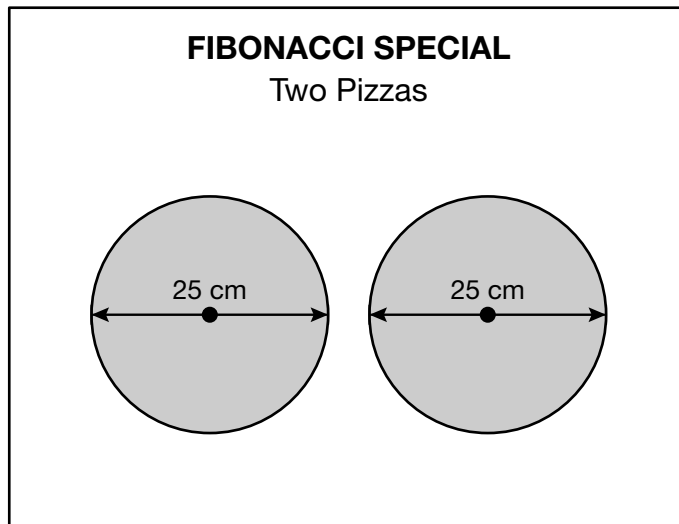


What is the value of $\angle ABC$?

- A 33°
 B 42°
 C 52°
 D 63°

22 Pizza Puzzle

One weekend, a pizza shop offers two specials for the same price. The pizzas are all the same thickness.



Determine the diameter of the Galileo Special if the two specials contain the same amount of pizza. Show your work.

